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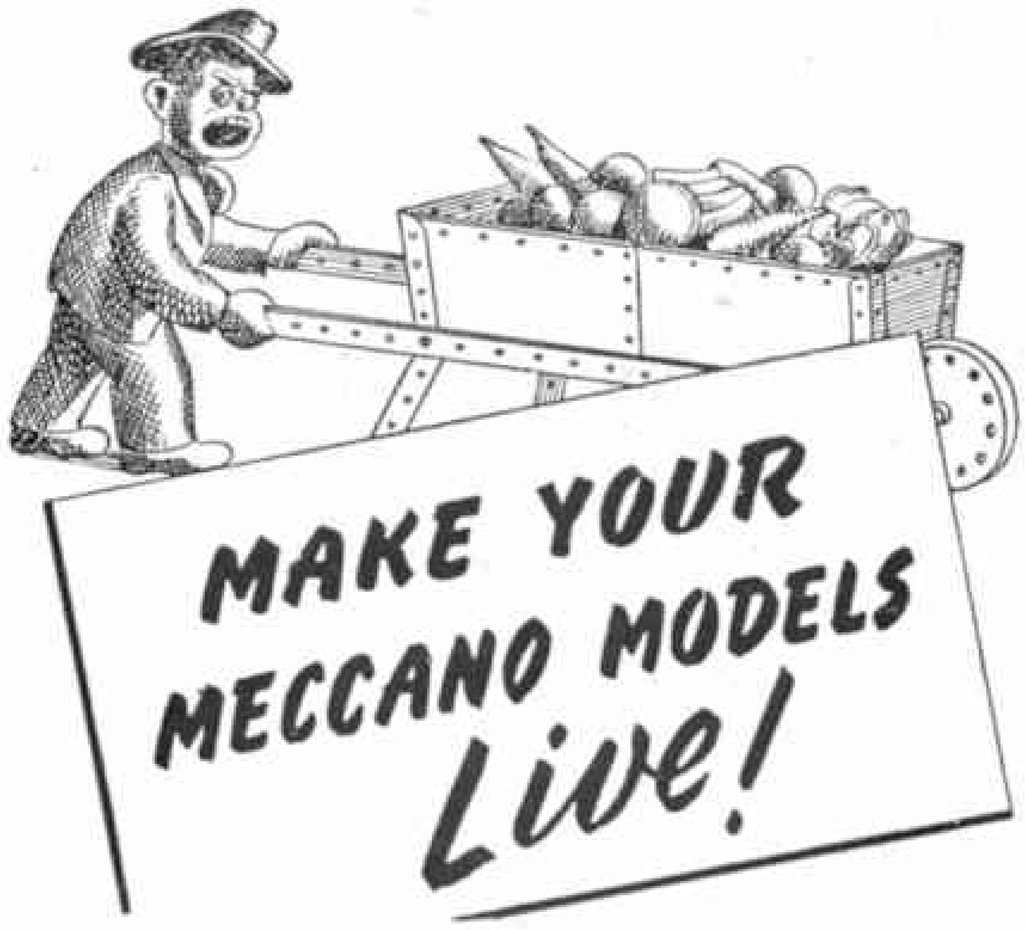

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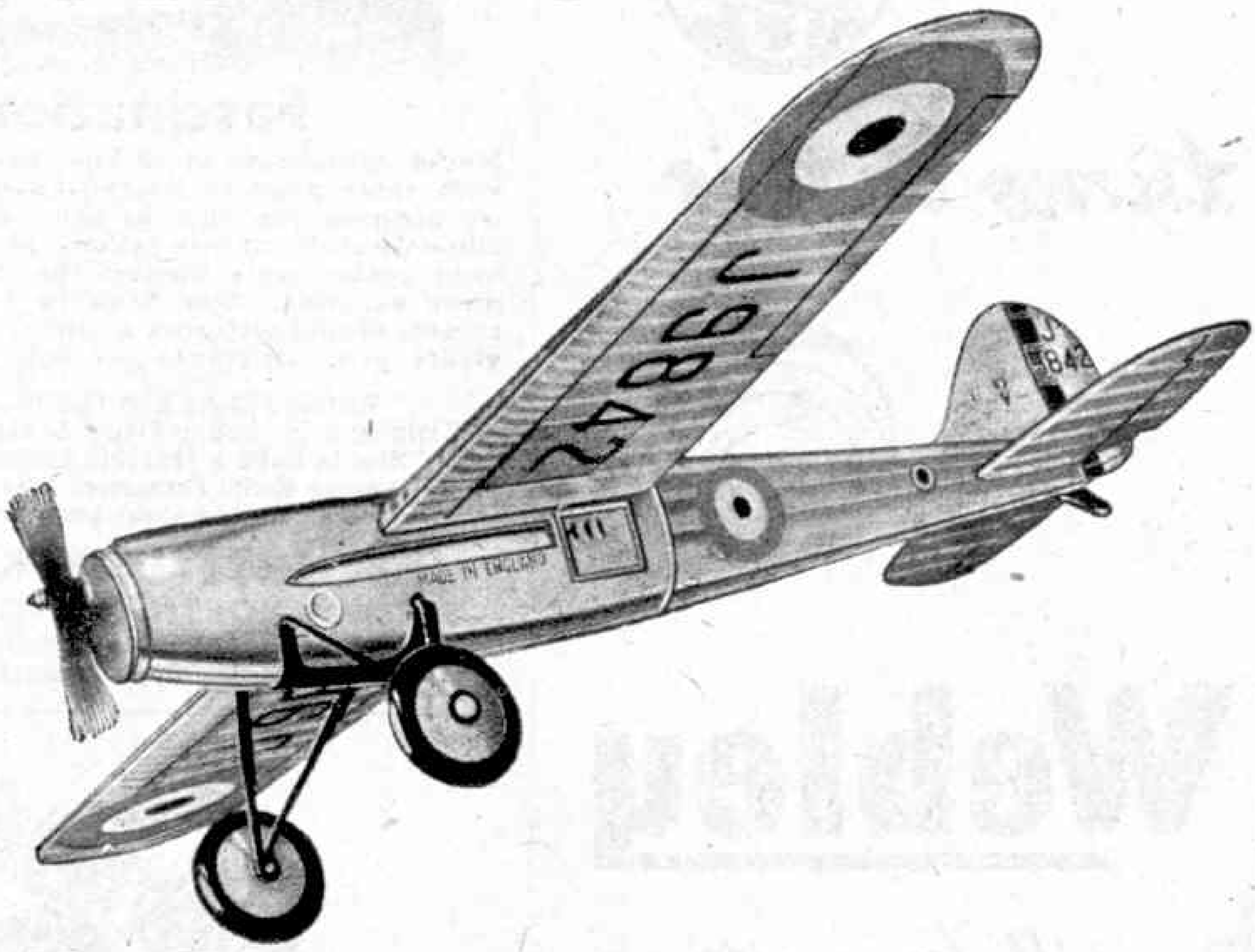

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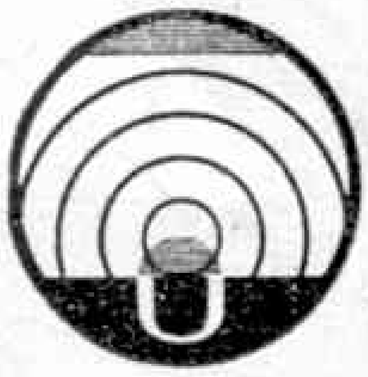

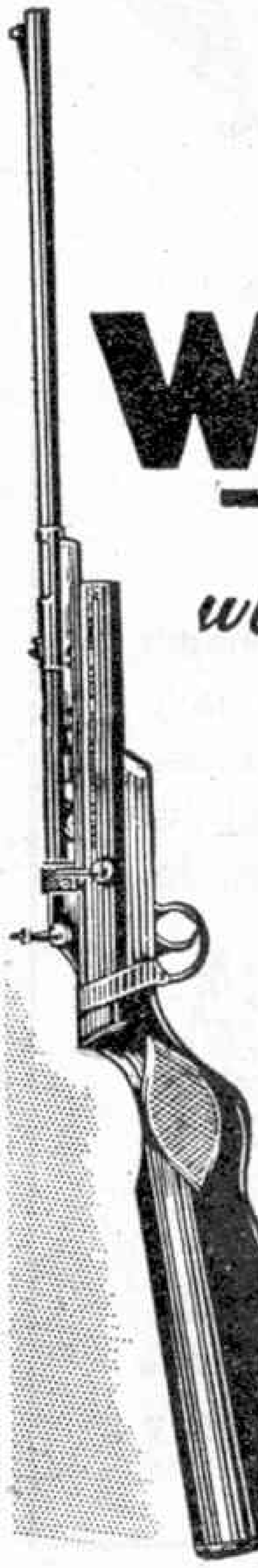

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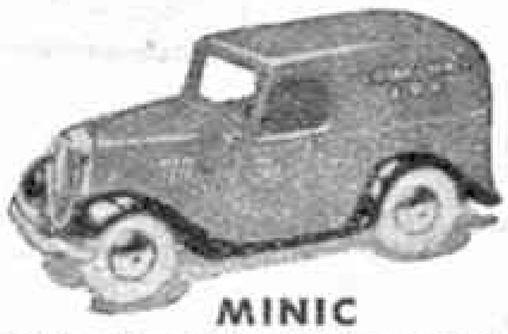

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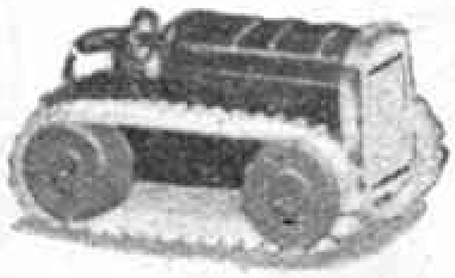

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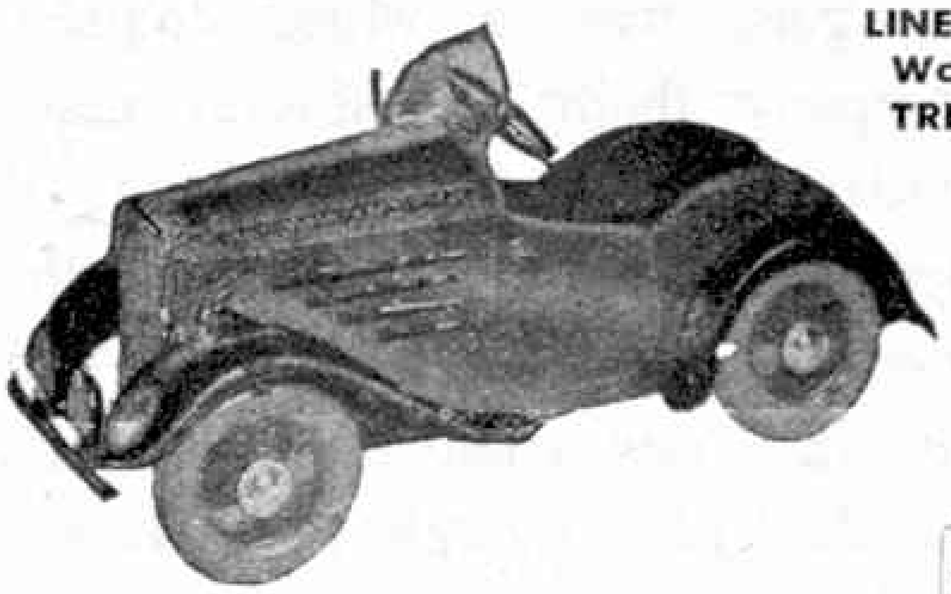

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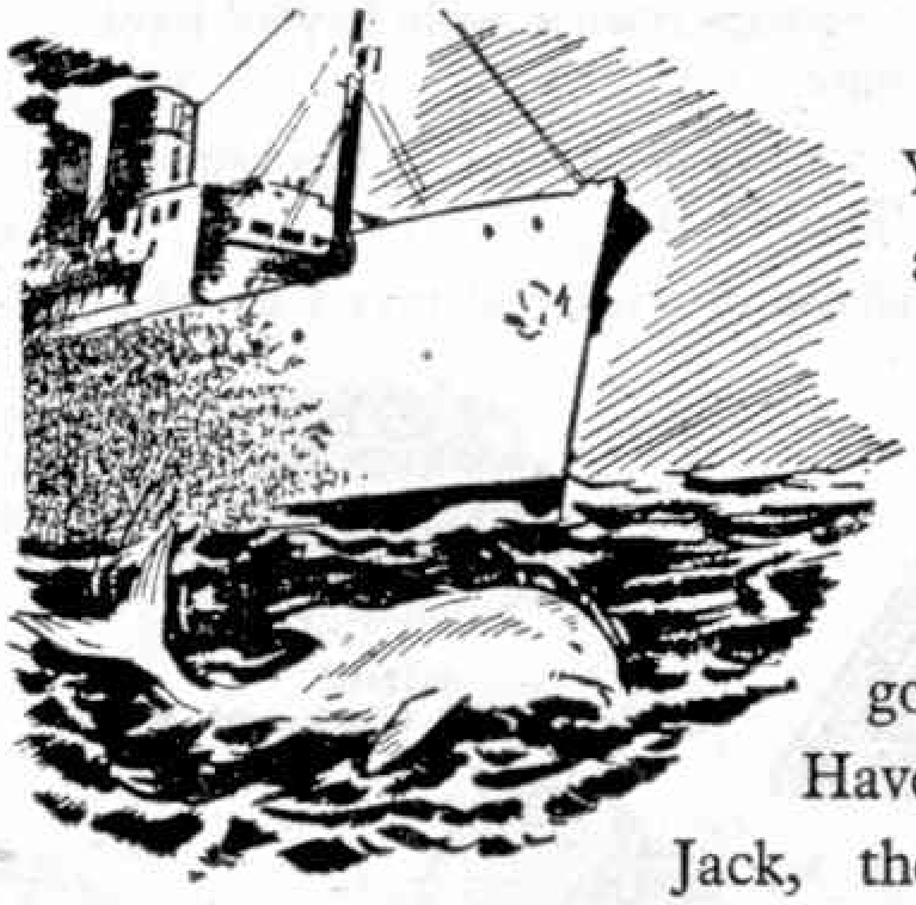

Yes, B.S.A. Bicycles and exciting stories are as popular with boys and girls in New Zealand as they are with you. And many a tale is told at the end of a good day's cycling.

Have you heard of Pelorus Jack? Pelorus Jack, the story goes, was a white dolphin. He used to meet steamers and accompany them for several miles along stormy Cook Straits, which divide the two principal islands of New Zealand. Travellers simply called him the pilot-dolphin of the Cook Straits. Maori mythology even sees in Pelorus Jack an ancient sea-god, but all travellers insist they saw a real dolphin 15 ft. long! This story is still alive in New Zealand although Pelorus Jack disappeared suddenly in April 1912, after having performed his pilot duties for 20 years.

Since the war, you may imagine that B.S.A. Bicycles have disappeared too, but they are only in short supply. If you aren't a lucky B.S.A. owner yet, ask your parents to see your local dealer. He'll do his best to help you.

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CHRISTMAS GREETINGS TO ALL MY READERS!—From the EDITOR

MECCANO MAGAZINE

Editorial Office:
Binns Road
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Vol. XXIX
No. 12
December 1944

With the Editor

Stopping the Splash

The announcement that the New York Central System of America have introduced a new type of tender water scoop, with which engines can pick up water with maximum efficiency at 75 m.p.h., reminds me of the great improvements that have been made in pick-up arrangements since 1860 when the idea was patented by John Ramsbottom. The first picking up was definitely a wet and wasteful business. When the scoop was lowered while the engine was travelling at high speed, a sort of tidal wave resulted. The water was thrown up with such violence that it often enveloped the first coach; and regular travellers soon learned to close the windows when the train was approaching points at which troughs were situated.

Apart from the fact that deluges of this kind did not tend to increase the popularity of the railway, the great amount of water wasted was a source of considerable loss, because the water supply often had to be obtained from some special source, and always required a pumping installation.

In the early days the greatest efficiency in picking up was reached at about 40 m.p.h. At higher speeds the amount of water collected in the tender did not increase, but the splash most certainly did. Rather curiously, however, it was not the general custom to restrict speed when passing over troughs, although on the former G.N.R. it was at one time the rule for expresses to slow down to 30 m.p.h. for picking up.

Some years ago the L.M.S. introduced a deflecting device that rode through the water in front of the actual scoop and had the effect of "building up" the water in the middle of the trough, so that the scoop picked it up with the minimum of side splash. In the course of experiments that led to the use of this device the cinematograph was used, and the effects of different arrangements at different speeds were recorded by an observer who had to ride inside the tender in a special compartment built into the tank!

In the New York Central design the cross-section of the scoop, and also that of the delivery pipe into the tender, is increased, and special vents are provided to lead away excess water and thus prevent overflowing of the tender under the fierce action of the water at high speeds. The new design permits of the lifting of 7,100 gallons of water at 75 m.p.h. from troughs with an effective length of 1,700 ft.

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War Dogs at Work

By David Gunston

AS the dog is man's oldest domesticated animal, it is not surprising that it should have been used down the ages in warfare. What is perhaps surprising is the fact that, in the present highly-mechanised conflict, where tanks and aircraft play such an important part, room has been found to make use of trained dogs for a very large number of useful jobs.

Dogs were used in the last war, but now efficient organisations have been set up, both by ourselves and the Germans, to employ them on an even larger scale. The Germans have in fact made quite a study of the art, and even in peacetime kept numbers of so-called "police-dogs" which would form the nucleus of dog armies in time of war. We knew that the enemy were using dogs in this war, and when our men landed in Normandy they found large highly-trained dogs doing key jobs in the Nazi defences. Now a lot of them have been trained to recognise their new masters and are doing us a useful service.

War dogs in training. Attacking a "suspect" well padded for the occasion.

In Great Britain, although there are several training schools where selected animals are trained, the whole organisation has been to a considerable extent secret, so as not to give Hitler any information that might be of use to him. But in the United States similar training has been going on with more publicity, and we may conclude that we are doing much the same as our Allies across the Atlantic.

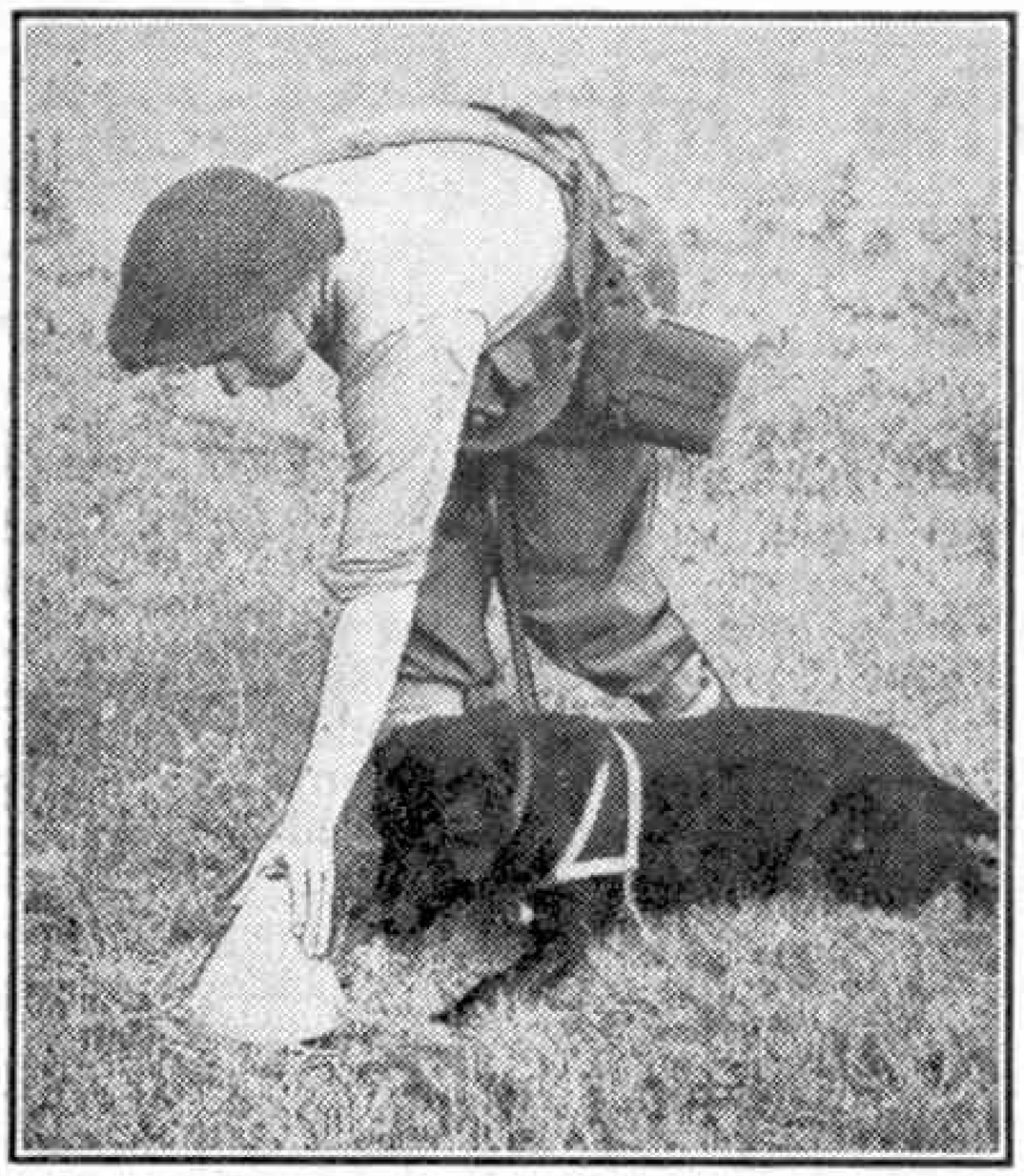
Much of the secrecy has had to be relaxed from time to time to ask people with suitable dogs to hand them over for the war effort; for although some of these magnificent animals have been bred in Government kennels, most of them came from private homes.

There is one chief difference between the modern war-dog and his predecessors in ancient times. In those days dogs fought alongside their masters on the field of battle and were taught to attack the opposing armies. To-day in open conflict dogs would not stand much chance against modern automatic weapons, tanks and shellfire, so where they are likely to come to grips with the enemy they are trained to do so under more even conditions. For example, they may have to attack para-troops at night, or spies intruding on secret aerodromes, dumps and camps.

The majority of the animals are used for less spectacular yet equally important jobs like scouting, carrying messages, food, water, ammunition, medical supplies, searching for wounded on the battlefield, and so on.

Like human recruits, war dogs have to be fitted for their particular job, and have to be fighting fit before they are accepted. Considerable care has to be taken to get the right dogs, for only the really first-class animals will repay the extensive training necessary. Of course only the larger breeds are wanted. Those most in demand are Alsatians, Newfoundlands, Airedales, Bull Terriers, spotted Dalmations, Pinschers, Afghans, Collies and Elkhounds. This list does not include any gun or sporting dogs like Retrievers, Pointers or Spaniels. This may appear strange, for these are among the most intelligent of creatures, but the reason is that they are far too interested in following up strange scents on the ground. After all it would not be much use sending a dog off with a vital message to find later that it has chased off in pursuit of a rabbit or a bird!

After a strict medical examination by a "vet," each dog is branded with a number inside the ear, but the dogs know their own names and they very soon learn



The "Handler" locates the mine that the labrador has found.

who is their particular trainer.

When the new entrant comes from private owners as much information as possible is found out about its habits and temper and its attitude towards strangers. These details are entered up on a form which is completed by the addition of the animal's "paw-print."

At the training-schools are rows of large kennels each housing one dog. Discipline is strict in these "dog-towns," and meals are given at fixed intervals. The trainers are soldiers or airmen who love animals, and although the work is not easy it is most interesting. Different types of teaching have to be applied for the different jobs. If a dog is of the correct breed it may be chosen to be a "commando" dog for sentry and guard duties, where by day or by night it must be ready to spot any intruders, and if necessary attack them and hold them down until human help arrives.

Training for this work involves the use of two men, one to act as the "enemy." He needs protection from 42 sharp teeth and a jaw pressure of 500 lb. on his throat or wrist, and so is well padded with wooden splints, wire gauze and thick clothing. A well-trained dog of this type can floor a man in a few seconds, provided it catches him unawares.

Scout and messenger dogs are taught differently. The former have to hare over miles of countryside to follow up artificial trails laid by their trainers. On the other hand messenger dogs carry their signals in a small canister fastened around the neck. They have to go out on journeys of gradually increasing length over many miles of rough open country. To make things more realistic, crackers are fired off to accustom the dogs to the conditions of actual battle that they will meet with later.

Transport animals are taught in much the same way, carrying their stores on their backs to certain points where they are needed in battle.

Very recently in France skilful dogs have been used to clear mines from roadways. By scenting out hidden buried mines and indicating the exact positions to troops, they have proved themselves to be the most efficient mine-detectors known. The men with the dogs mark each mine with a white cone, and along come the sappers to render them safe. This method of mine-detection was found to be speedier and less dangerous than the use of electrical devices formerly employed, and for the deadly German all-wooden shoe mine, it was the only method of certain detection. Being lighter than men dogs could approach the mine-ridden area with much less risk.

The wonderful intelligence of these dogs is matched only by that of the first-aid dogs who cover many miles seeking the wounded. Comforts are carried to each man, and later the stretcher-bearers are led to each spot by the same dogs that discovered the casualties.

Yes, we owe a lot to the devotion to duty of our four-footed soldiers.

American soldiers training a dog for guard duties.

The Air Forces of The United States

II—Meet the 8th Air Force

By C. G. Grey

(Founder of "The Aeroplane," 1911, Editor until September, 1939)

BETWEEN wars I came to know fairly well a certain U.S. civil pilot named Jimmy Doolittle. He was concerned with the great Standard Oil group. Early in the U.S. war he distinguished himself by leading a formation of twin-engined bombers off a U.S.N. carrier in the Pacific and bombing the sacred city of Tokyo. He and most of his men landed in China. The Japanese got the first big shock they have had since their heads swelled.

Mark you, taking even medium bombers off the flying deck of a carrier is no mean feat. It had never been done till those gallant lads, led by their young middle-aged C.O. did it. And the next thing we heard was that Jimmy Doolittle had become a Brigadier General.

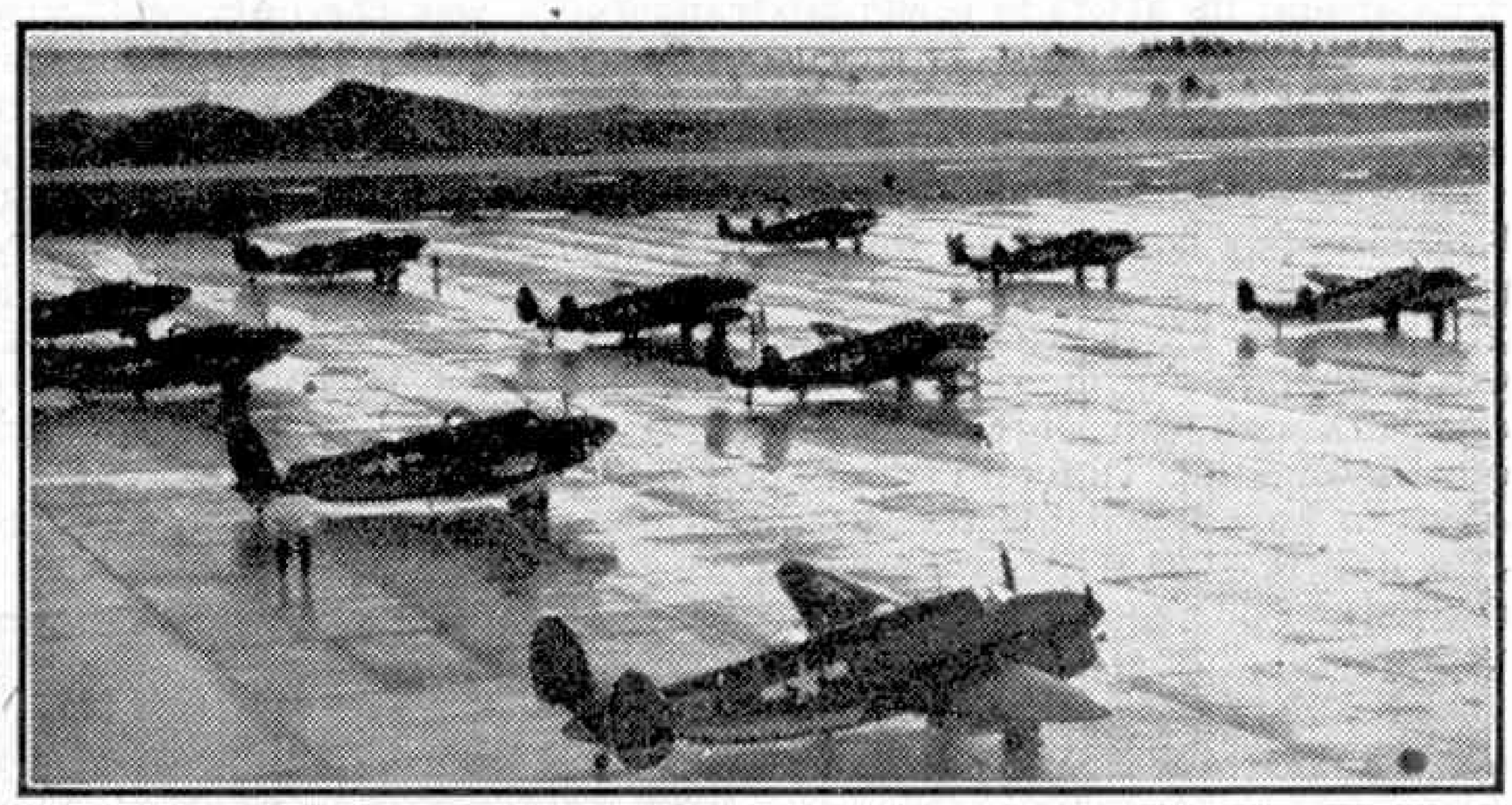
Then he appeared in North Africa with a bombing force, and won the highest regard of such war-stained veterans as Sir Arthur Tedder and Sir Arthur Coningham, who between them had virtually blasted the road for the British Army from Egypt to Tunis. And the next thing we heard was that he was commanding the U.S. 8th Air Force of heavy bombers and was co-operating on most cordial terms with Air Chief Marshal Sir Arthur Harris, A.O.C.-in-C. Bomber Command, R.A.F. Altogether no mean achievement for a man who two years before had been a civilian. And the more he works with our people the better they like him and the more highly they think of him.

Some weeks ago I had lunch with him and his staff and was told much which raised still higher my already high esteem of the U.S. fighting man. When he is properly trained and equipped there is none better, and when he is neither he is still a fine fighter, as the American Civil War showed.

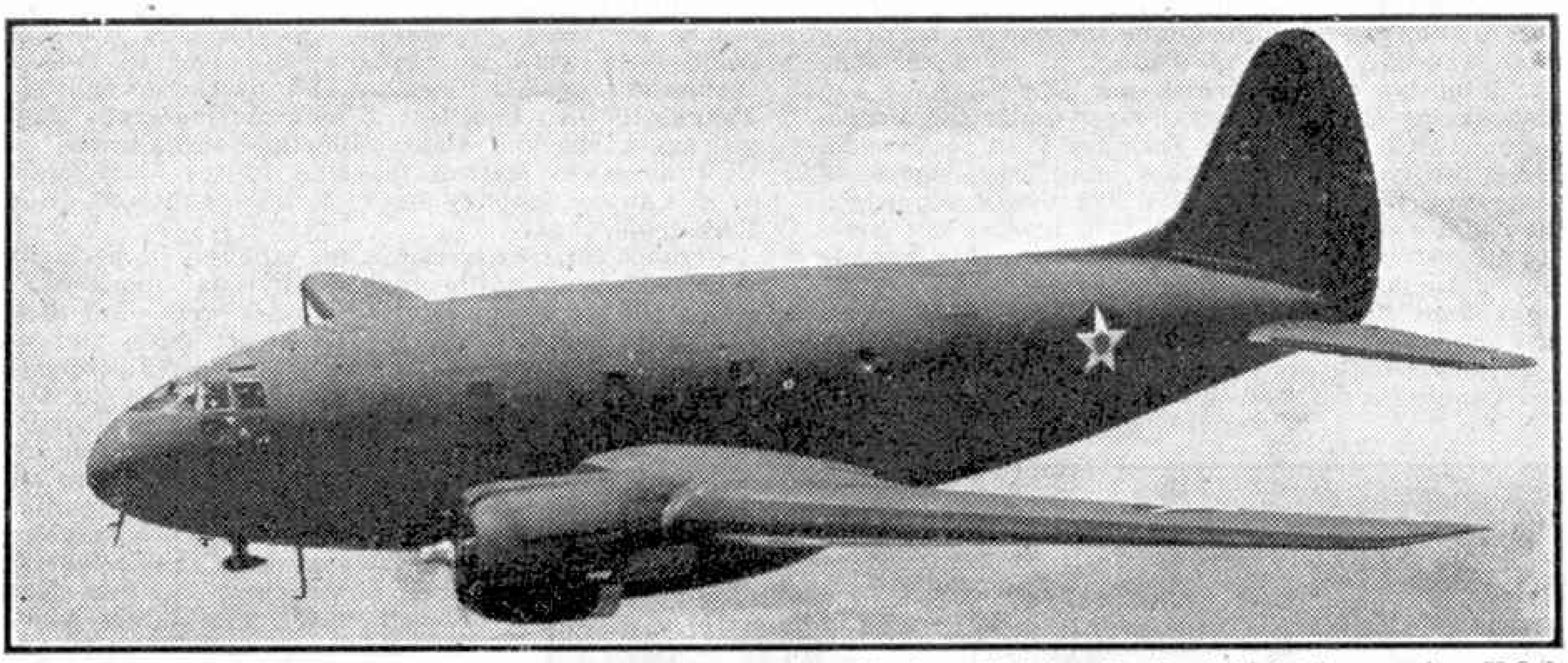
Later in the day I went with Col. Lear of 8th Air Force Staff to see a squadron of "Flying Fortresses" come back from Germany. Their luck was out. They had run into high cloud, so could not see to keep formation. And their "pattern-bombing" depends on their keeping close formation. So they had bombed what they call "targets of opportunity" and come home.

What impressed me most was their high standard of piloting. Each formation came over in close order, for big stuff. Each machine "peeled off" in turn and landed beautifully, with not more than 45 seconds headway between each and its next ahead and astern. Their approaches were so clean that one could only tell when they touched down by the puff of smoke as the friction of the concrete runway burned a strip off the tread of each tyre. You can imagine the jerk when an enormous tyre of this size, standing still in the air, hits concrete and has to start instantly to revolve at about 100 m.p.h. or more.

The U.S. bomber crews are very much like our own, but one notices a higher proportion of what we might call "foreigners" among the Anglo-Scottish-



Lockheed PV-1 "Ventura" bombers at a U.S. Navy base in the Aleutian wastelands. Official U.S. Navy photograph.



Curtiss "Commando" transport. Photograph by courtesy of the Airplane Division, Curtiss-Wright Corporation, U.S.A.

Welsh-Irish-German-Scandinavian-Dutch Americans. There are so many Central Europeans in the States, Bohemians and Hungarians and Italians and Latvians and Lithuanians and Poles and Greeks and Bulgars and so forth, that we do not get. On the other hand I saw no Negroes among the U.S. crews, whereas at an R.A.F. bomber station at 04.00 hrs., after a raid I have seen a coal-black fellow-citizen from Barbadoes drinking our alleged coffee with a wild-looking man who, so an R.A.F. officer told me, was a Mexican (obviously an indigenous Aztec or Toltec or some such, and not a Spanish-Mexican) who had come over to fight Fascism.

But as the "foreigners" in the U.S.A.A.F. are U.S. citizens, sometimes of two or three generations back, they are all lumped together and are not pushed into separate squadrons, as are our gallant "Free" Allies, and even our own people from our Dominions. That latter is, I believe, an idiotic policy, because it tends to isolate or insulate our Dominials or Colonials, when we have the chance of centuries to weld them all into one Imperial whole for the strength of the British Commonwealth of Nations. The U.S. Army people have more sense. They put all breeds (except Negroes) into the one melting-pot. This community of danger and victory in the U.S.A.A.F. must go far towards producing a united nation.

Those U.S. crews got real "cawfy" when they landed. It was good after the wash which served to us British as coffee.

The "Flying Fortress" is a fine aeroplane. My pilot friends tell me that it is beautiful to fly. But it suffers, like the "Liberator," from having been put into mass-production too soon—and, incidentally from being over-publicised. Also the name "Fortress" is a mistake. A fortress implies something that is impervious (or nearly so) to attack. The "Flying Fortress" is no more invulnerable than is any other piece of sheet-aluminium. In fact when the first "Fortresses" came over here they were not even armoured to protect the crews. We had to set up great "Maintenance Depots," as we called them, where U.S. aircraft of all sorts were modified to make them warworthy. But to-day, as I will explain later, the U.S.A. Air Service does the modifications.

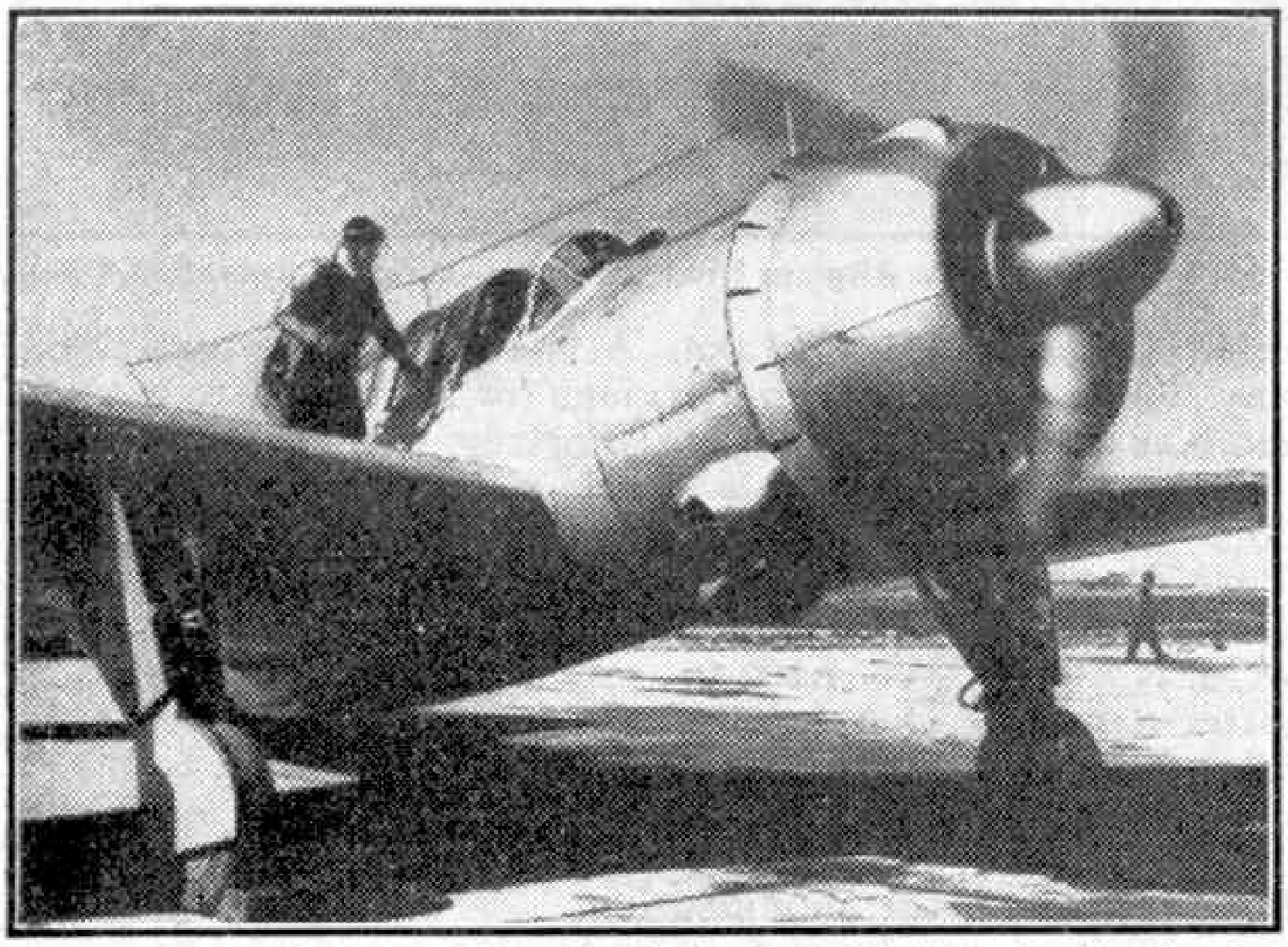
In fact, in spite of a wonderful story in the U.S. "*Saturday Evening Post*" about how the "Fortresses" had arrived in England just in time to save the nerve of R.A.F. bomber crews from breaking, the first "Fortresses" and "Liberators," which were sent over before Pearl Harbour, were useless as bombers, and the R.A.F. had to take out the heavy superchargers which gave their engines the power to go up high, and took out some of their guns, and loaded them with depth-charges and sent them on long-range ocean patrols against submarines. Their great virtue was their reliable engines, their immense petrol capacity, and the fact that they were easy to fly. And as submarine hunters they served the R.A.F. very well.

Even to-day the "Fortresses" and "Liberators" are 50 miles an hour or more slower than our "Lancasters" and "Halifaxes," and carry rather less than half the load. In fact, as is plain to anybody who likes to do a little arithmetic with official figures, a U.S. bomber with a crew of ten carries about the same bomb load as a "Mosquito" with a crew of two, and the "Mosquito" is about 150 miles an hour faster.

All of which is the more to the credit of

the gallant lads who man the big U.S. bombers. Because they were rushed into the war so suddenly there was not time to give the U.S. crews the long and intensive training which our R.A.F. chaps had been having for three years longer under the British Commonwealth Joint Air Training Plan in Canada. Consequently, although they had the finest of navigating instruments and a bombsight for which the claim was made that with it a bombardier could put a bomb into a barrel from 20,000 ft., they bravely went into action when only a small percentage of them knew how to use the equipment. I may add that the latest U.S. bombers use a British bombsight.

So they had to fly in strict formation. The leader and deputy leader had a first-class navigator and a



Getting ready for the take-off. A Curtiss "Helldiver" dive-bomber "warming up."

first-class bombardier. The navigator brought the formation direct to the target. And then came the "pattern-bombing" which was so effective. The No. 1 bombardier dropped his bombs. No. 2, No. 3, and so on, had orders *not* to drop their bombs till *they saw the bombs* dropping out of their next ahead. That meant that by the time the bombs had dropped far enough to be seen by the next astern, the second rank of the formation would be up in the same patch of air, so to speak, as the leader had been in when he dropped his bombs. And so with the 3rd and 4th.

Thus, wherever the leader's bombs fell the next load would fall on or just round the same place. Then the third rank would drop their bombs when they saw the bombs falling from the second rank, and by that time they also would have moved into the same patch of air. And so on, according to the length and size of the formation. But anyhow the pattern of the bomb-craters on the ground was bound to be much closer than it could have been if each bombardier had tried to hit the target himself.

If the leader's bombardier made a mistake, then they all hit the wrong target. But that did not often happen. Also if the leader's navigator went wrong they all went to the wrong place. But that was not often either. The worst trouble was that if the leader and deputy were shot down a good many of the formation lost themselves—as in the first attack on Ploesti in Rumania, which started from Egypt. The bombers had to come down low to hit the oil refineries, and some lost their formation. So several of them landed in Turkey on the way back, and were interned. Then the Turks bought the aircraft, and said that the crews were entitled to be treated as delivery crews, so they were allowed to go home.

Naturally this limited training made night-bombing, in which the crew of each aircraft navigates and bombs for itself, impossible. So the U.S. bombers could only work in daylight, and had to defend themselves against German and Japanese fighters. Thanks to their excellent .5 inch machine-guns they put up a splendid show. Whether the gunners or their ancestors learned to shoot in the Wild West or in Chicago, nobody seems to have enquired. But they *could* shoot.

Perhaps their early claims for numbers of Germans destroyed were optimistic—my friends among U.S. senior officers say probably that they were—but they did do in a lot of Huns. The bigger guns, and so many of them (often ten or a dozen per aircraft) and the heavier ammunition, added a lot to the load. But there is no disputing that the U.S.A.A.F. bombers all over the world have done grandly.

Their fighters have been equally good, but as with the bombers, they never had a first-class aircraft until quite lately when the "Mustang" came out. It was built to a British specification, and when the Packard-built Rolls-Royce "Merlin" was put into it, the "Mustang" came right up into the same class with the Hawker "Typhoon" and the contemporary "Spitfires." But whether in the earlier "Mohawks" or "Kittyhawks" or "Tomahawks," or the later "Warhawks," or the twin-boomed "Lightnings," the U.S. fighter pilots have put up most gallant fights against the Germans and have been right on top of the Japanese all the time.

THE U.S.A.A. SERVICES

The U.S. Army Air Service Command, as I said earlier, services all U.S. aircraft. It modifies new types to make them warworthy and keeps older types in flying trim. Because U.S. factory production is on such a huge scale any alteration or modification to aircraft on the production lines or assembly lines would cause hopeless upsets and delays. So making the alterations over here is cheaper in the end. We built and organised huge factories for these jobs before the U.S. came into the war, and, soon after Pearl Harbour, the U.S.A.A.S. Command took them over, built others, expanded the old ones, re-equipped them and manned them.

Being in the war areas the people of the Service Command know much more about what is what than do the scientists and designers and draughtsmen back home who produce the stuff in which the boys over here risk their lives.

When the States came into the war in 1942 one of these Service Depots which we were running had some 3,000 hands. When I saw it in 1944 it had been enlarged out of recognition. Square miles (or so, it seemed) were being bull-dozed to make runways or foundations for new shops.

The colossal machine-shop in which spare parts for engines and aircraft are being made somehow struck me as looking queer. Then suddenly I spotted that it was full of able-bodied young men, and that in years before I had been accustomed to seeing only a few foremen and charge-hands in shops where all the machine-hands and bench-workers were girls and women.

That gave me the key to the immense potential power of the United States, if ever they were stretched to their limit in war. Remember that their "draft," or conscription, does not touch any man over 30; that no married men have been called up—all married men in the U.S. armed forces are volunteers; that there is no penal

(Continued on page 430)

A Famous Monitor

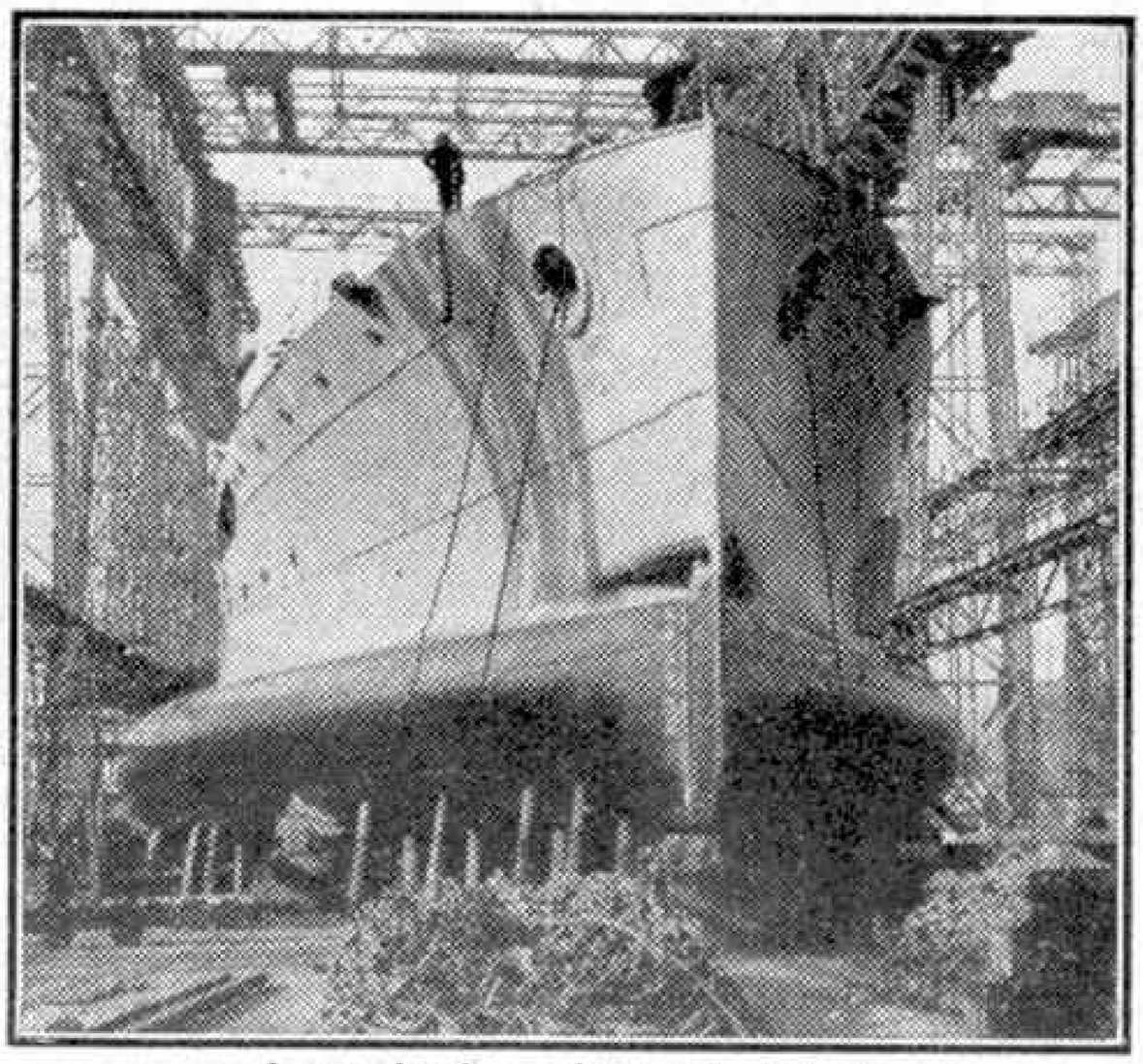
By Denis Rebbeck, M.A. (Cantab.), M.I.N.A., A.M.I.Mech.E.

H.M.S. "*Erebus*" is a 28-year-old monitor, one of the oldest ships in the Royal Navy. She still has her original boilers and engines, and throughout her long career she has not once been delayed by defects; since the end of 1941 she has steamed over 40,000 miles. This famous ship was built and engined by Harland and Wolff Ltd. at Govan, under the emergency war programme in 1916, and is of 7,200 tons displacement. Her crew number 315 and the ship has seen plenty of action in two wars. Her overall length is 405 ft., beam 88 ft. and mean draught only 11 ft. Two 15-inch high angle guns with a range of 40,000 yards, two 3-inch anti-aircraft guns and 12 smaller guns make up her armament, and the hull is suitably protected with armour.

The most interesting features of the hull are the 15 ft. deep anti-torpedo bulges, divided into 50 watertight compartments, and the bow rudder, the latter being fitted under the forefoot. These items are shown in the accompanying photograph of the sister ship, H.M.S. "*Terror*," also built by Harland and Wolff Ltd. in 1916, but unfortunately sunk in action with enemy aircraft off the Libyan Coast in April 1941. The "*Erebus*" is powered by two triple expansion engines, the designed 6,000 h.p. giving the ship a speed of 12 knots; steam is supplied by Babcock boilers.

It will be appreciated that monitors, which are specially designed for bombarding enemy targets from close inshore, are particularly liable to damage and attack from enemy batteries, planes, submarines and surface craft. During the present war the "*Erebus*" has served in the East Indies, in the Mediterranean, and in the recent successful attack on Le Havre; while during the Battle of Britain she helped to beat off enemy attacks.

As long ago as 1917 the "*Erebus*" was in action off the French and Belgian coasts, when she was hit by bombs and by an electrically-controlled motor boat, but luckily she sustained only slight damage. After the last war she was engaged in operations in the White Sea and in the Baltic, and in six months she steamed 7,000 miles. The next 20 years of her life were spent as a turret drill and cadets' training ship. In 1939 she was re-armed and made ready for active service again.



A monitor's anti-torpedo bulges.

For 18 months she was in home waters, during which time she served as an outer defence ship at the mouth of the Thames and carried out several bombardments of the Channel ports. Then she left the United Kingdom to join the Royal Navy in the Mediterranean, but was diverted to the East Indies Station while on the way out.

Her good luck held, and she survived a heavy air attack by the Japanese at Trincomalee. Later, in the Mediterranean, she covered the Sicilian and Italian landings, and at one time this ship found herself under fire from two different enemy batteries on different sides of the Straits of Messina. The ship's company were pumping shells into Sicily as well as into the Italian mainland, and the bombardment lasted for 50 minutes. H.M.S. "*Erebus*" was not hit once, although she survived about thirty near misses!

When the enemy sank a hospital ship near the monitor, the "*Erebus*" ignored danger from submarine and air attacks and went to the rescue, thus making herself a sitting target. She picked up some survivors, including several hospital nurses.

On the Track of the "Irish Mail"

The Centenary of the Chester and Holyhead Railway

By R. A. H. Weight

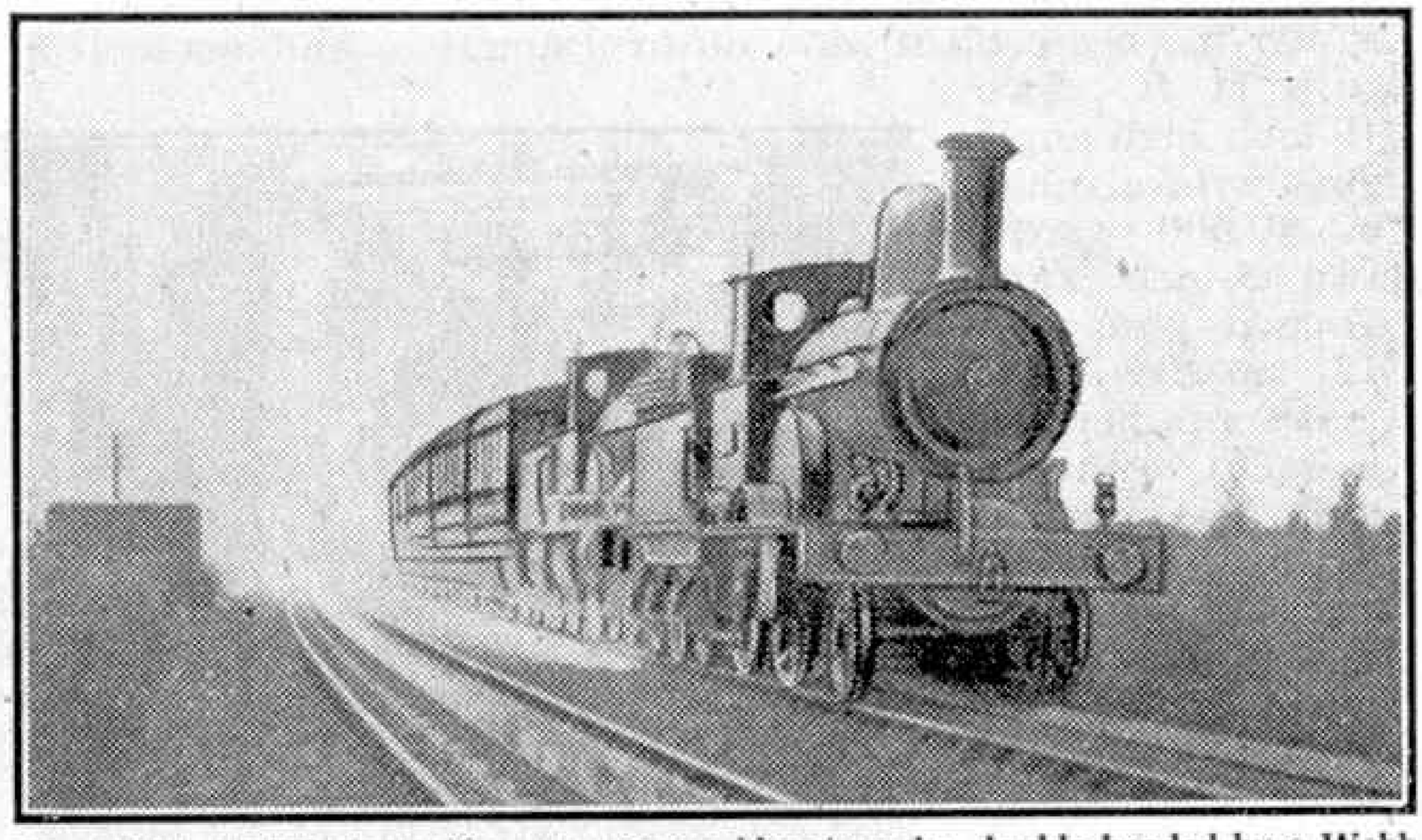
JUST one hundred years ago, in 1844, construction of the Chester and Holyhead Railway was authorised by Parliament. It was a bold scheme for those days, involving a capital expenditure of £2,000,000, including initial harbour works at its western extremity in which the Government were particularly interested on account of their desire for improved communications with Ireland. The scheme was backed by the London and Birmingham and the Grand Junction (afterwards London and North Western) companies and in view of the fact that the line now forms an interesting and busy part of the L.M.S. main Irish Mail route which many readers have traversed while holiday bent, this seems an opportune moment to describe some of its principal features and landmarks.

Traffic operation began in 1848 between Chester and Bangor; also between Holyhead and Llanfair P.G., the Anglesey village reputed to have the longest name in Britain if fully spelt out. The Menai Straits, an arm of the Irish Sea between the Welsh mainland and the Isle of Anglesey, still had to be crossed by ferry for several years more, although Telford's magnificent suspension bridge for road traffic had been completed earlier in the century as part of that eminent engineer's bold London-Holyhead road. Just as Telford had used his Conway suspension bridge farther east on the same route as a model and experiment for the much greater structure over the Menai Strait, Robert Stephenson, who was engineer for the Chester and Holyhead line, designed a tubular iron bridge for his crossing of the Conway river near Llandudno, and carried the idea further by bridging the sea in similar though much vaster style. The Britannia railway bridge was the first of its kind on so large a scale. To meet Admiralty requirements it had to be built clear of interference with shipping. The bases of the rectangular tubes through which the trains run are 130 ft. above low water mark, while the two main spans are each of 460 ft., the central stone pier being anchored to an island. This fine bridge is 1,843 feet long and still stands to-day capable of carrying the heavy modern locomotives and express train loads. It is approached on one side by an impressive sweeping curve guarded by sculptured lions, in a beautiful situation, though a disadvantage from the passenger's point of view is that while actually crossing a tubular bridge nothing can be seen as one appears to be in a tunnel.

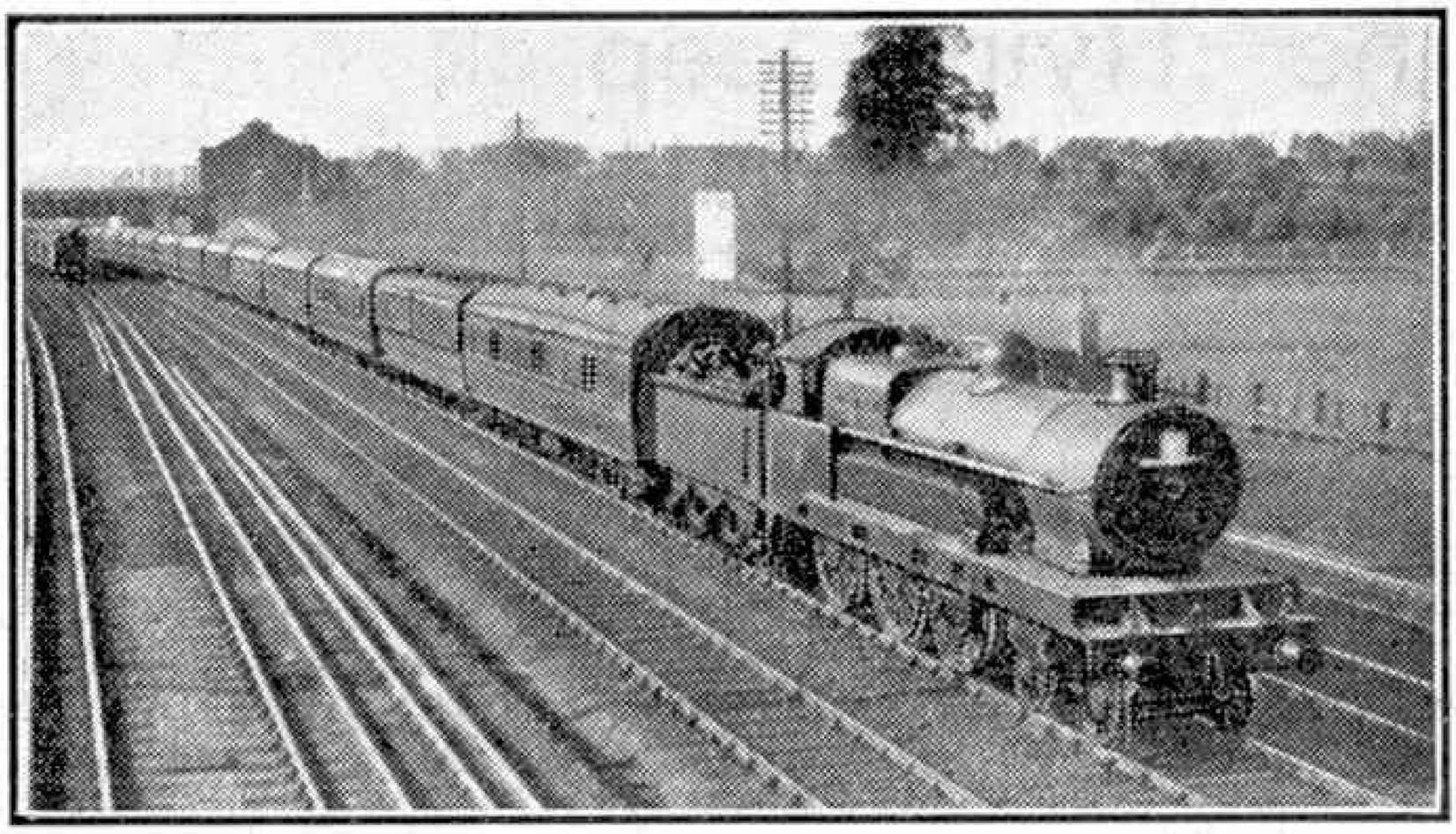
In 1859 the Chester and Holyhead ceased to be a separate company when it was merged into the London and North Western, which railway had been working it for some years. So it became united with the main line from Euston and Crewe and was henceforth the through route of the "Irish Mail." Government contracts were forthcoming, provided that train and steamer services to and from Dublin were accelerated and arrivals secured within certain time limits. Under the auspices of Mr. John Ramsbottom, Northern Division Locomotive Engineer of the L. and N.W.R., the first water pick-up troughs in the world were laid between the Chester and Holyhead tracks at Aber in 1860, long before the plan of picking up water at speed developed elsewhere in Britain to any extent; while speedy 2–2–2 "single-wheelers," of which wheel type the pretty "Lady of the Lake" class were so familiar in Victorian days, created fame for fast travel with comparatively light trains in those parts. There was much double-heading.

During the more recent years of L. and N.W. operation the Holyhead main line was operated by Webb's three-cylinder and four-cylinder compounds; the famous "Jumbo" 2–4–0s and the "DX" and "Cauliflower" 0–6–0s that were capable of handling anything within reason. Following on during the present century came the "Precursor" 4–4–0s and the Webb and Whale mixed traffic 4–6–0s. The older engines still survived, mainly on the subsidiary services, and the last few three-cylinder Webb compounds hung on at Chester well after the bulk of the others of that uncertain type had been broken up. The superheater era saw the introduction of the "George the Fifth" 4–4–0s, and later the "Prince of Wales" and "Claughton" 4–6–0s.

Since the formation of the L.M.S. group in 1923, although Crewe L. and N.W. types have continued much in evidence, standard modern engines have also handled much of the traffic, which in summer is extremely heavy. Midland class "4" 0–6–0 and Compound 4–4 0 engines came into the picture, a number, of course, having been built by the L.M.S.; while to-day "Royal Scots" (including some of the latest rebuilds), together with various Stanier designs, are seen in striking contrast to the stout old veterans of yester-year, tender and tank. Since 1927 there have been through locomotive workings between Holyhead and Euston, 263½ miles, enginemen stationed at Holyhead coming through to London with the "Irish Mail," up one day and down the next. Reboilered "Claughtons" regularly shared this duty until supplanted by "Royal Scots" which could handle loads up to 500 tons or so on the 1939 timings. On the busiest days in Summer, when the northbound



The "Irish Mail" about 40 years ago on Aber troughs, double headed by a Webb three-cylinder compound as pilot and a four-cylinder compound. Photograph by R. Brookman.



A splendid view of the up "Irish Mail" showing clearly the mail stowage and Post Office sorting vans behind the tender. The engine is a "Claughton" 4-6-0. Photograph by Real Photographs Co. Ltd., Southport.

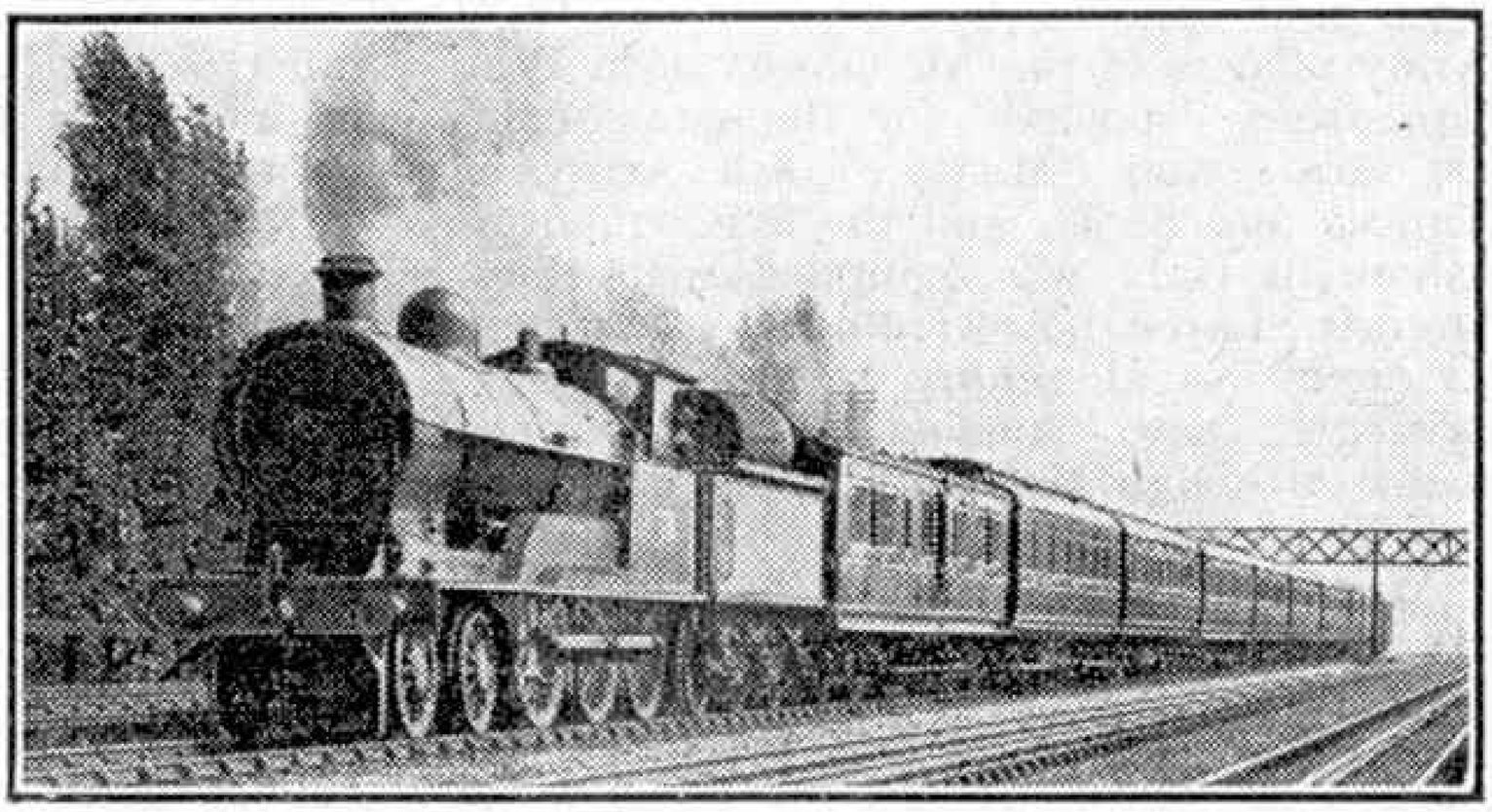
day mail ran in two parts before the war, the first portion worked by the Holyhead engine and crew was booked to run without a stop in about five hours. Normally, several stops were made, but the Irish boat expresses ran without a halt over the 84 miles between Chester and Holyhead.

The history of the Holyhead-Irish steamer services is interesting and somewhat stormy. The Chester and Holyhead Company was granted powers right from the start in 1851 to operate mail packets, being the first railway to do so. It used small, low-powered paddle steamers. But when the British Government insisted upon an accelerated through service from London the successor company, the L. and N.W.R., found itself in difficulties, especially during the bad weather of Winter. Powerful Irish influences were also brought to bear, with the result that for many years subsequently the mail contract was held by the City of Dublin Steam Packet Co., whose steamers, running between Holyhead and Kingstown, now Dun Laoghaire, were fiercely in competition with the L. and N.W. ones, though the railway carried the passengers, mails, and parcels on the English side for both.

The L. and N.W. operated its own steamers between Holyhead and North Wall, Dublin; in addition, until the last war it had a service between Holyhead and Greenore. From the latter port it owned and worked the Dundalk, Newry and Greenore line connecting with the Great Northern of Ireland at a point now not far from the Eire-Northern Ireland border. This arrangement was continued by the L.M.S. During the heyday of the Irish passenger traffic through Holyhead, 30–40 years ago, there were five services from Euston and principal Midlands stations each 24 hours. On account of political troubles and economic difficulties, there have only been two in the normal routine of the last two decades, and these have been L.M.S.-operated throughout, the sea crossing being accomplished by magnificent turbine, twin-screw steamers—veritable miniature liners of 3,400 tons, capable of a speed of 25 knots. They were named *"Anglia," "Cambria," "Hibernia," "Scotia."* Last time I crossed in one of those handsome ships on a calm summer evening, when we were about half-way from the Irish coast (it is 57 miles from Dun Laoghaire, the outport of Dublin, to Holyhead) it was possible at the same time to see the mountains of Eire silhouetted against a twilight sky, and the powerful beams of the Skerries and South Stack lighthouses off the North Wales coast for which we were making.

Holyhead Harbour was considerably enlarged in 1880. It has an extensive outer anchorage, protected by huge breakwaters, which serves as a refuge for shipping of all kinds during severe gales. The L.M.S. steamers berth alongside one of the arms of the V-shaped inner harbour where the trains wait in close proximity, with plenty of accommodation for passengers, baggage and mails under cover. The L.M.S. hotel and offices, looking clean and cheerful in their red-brick, stone dressed style of construction, are situated at the apex of the V. There are some steep climbs at 1 in 90–100 facing the Southbound "Irish Mail" in Anglesey, otherwise the Chester-Holyhead line is mostly easily graded. Holyhead is situated on a separate island that juts out into the Irish Sea west of Anglesey, but the bridge is a short one over the tideway as there is a causeway carrying railway and road for most of the distance between the two isles.

Among other attractive features of the present day Chester-Holyhead line may be mentioned the long stretches close to and in sight of the sea, also many grand marine views on one side with mountain panoramas on the other. Starting from the English end at the interesting General station (joint L.M.S. and G.W.), two short tunnels are traversed. Then, after crossing the River Dee, the train enters Wales and travels north-west parallel with the estuary of that river, through a rather dull sandy and partly industrial region. Near Talacre and the Point of Air, however, the open sea is soon reached as we turn west along the North Wales coast. Popular holiday and residential resorts, necessitating an enormous number of (*Continued on page 430*)



A down Chester express seen after grouping hauled by an ex-L.N.W.R. 4-6-0 of the "Prince of Wales" class temporarily fitted to burn oil fuel.

The "Flying Jeep"

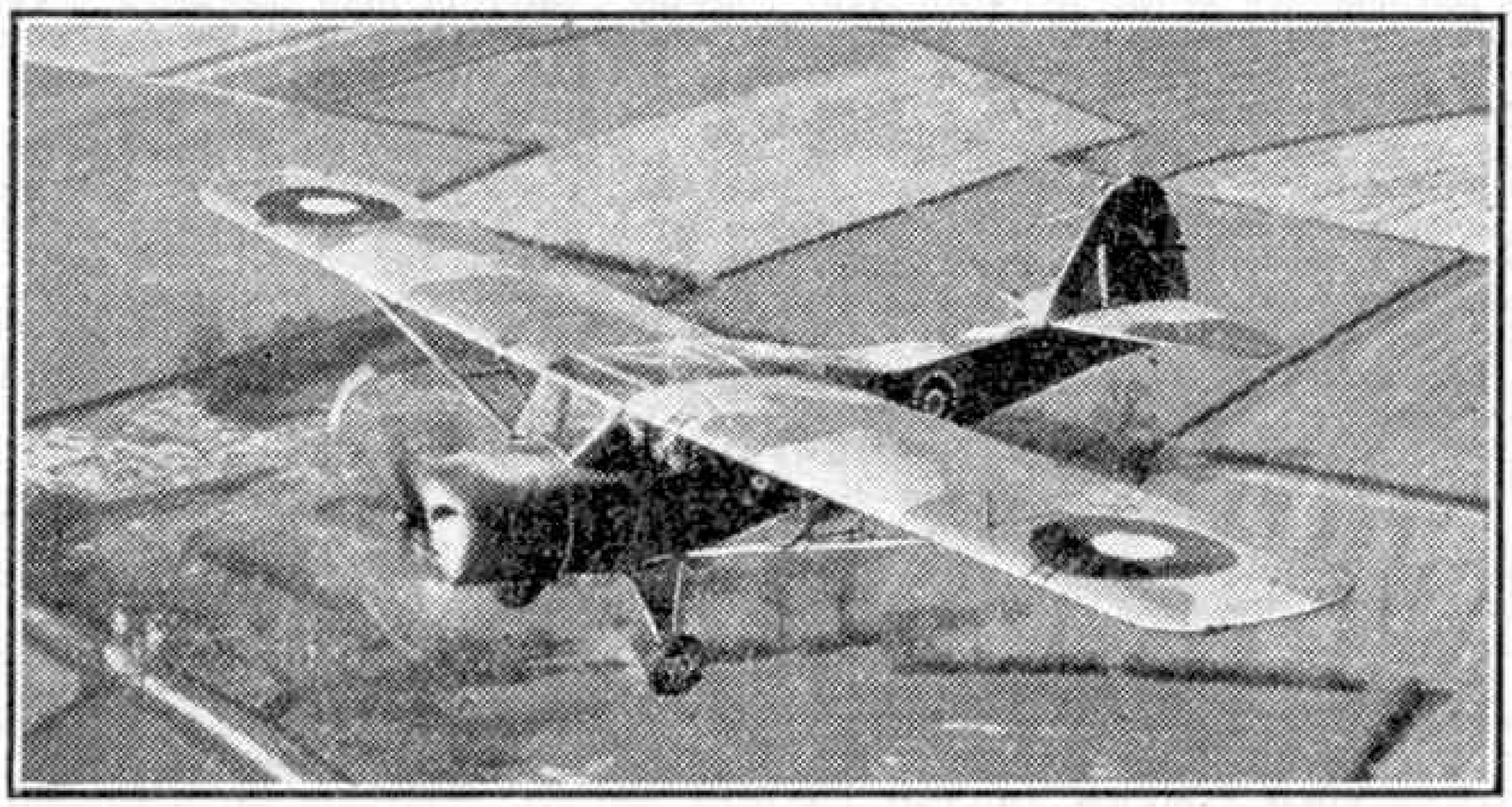
By John W. R. Taylor

THE Jeep has become almost a symbol during the last four years—a symbol of the United Nations' rugged will to carry on against any odds. From Iceland to the Western Desert, from Normandy to Burma and the Pacific Islands, the sun never sets on the fighting Jeep. Bad weather and the heat of the battle present no obstacles, and the road does not exist that the Jeep cannot negotiate.

For an aeroplane to be nicknamed "Flying Jeep" is therefore an honour indeed. The Taylorcraft "Auster" has proved itself well worthy of that honour. Before the war it was just a popular British three-seat light aeroplane. But when war came every aeroplane was needed for military purposes, and so the "Auster" went to France with the original B.E.F. on communications duties. It soon made a name for itself as an artillery observation machine, and earned the additional title of "The Eyes of the Army." "Austers," piloted by Army officers of the Air Observation Post Squadrons "spotted" for the guns of the 1st Army and "Monty's" 8th Army in Tunisia and Sicily, and the first squadron ashore in Italy was equipped with these aircraft. Later they were flown off carriers to direct Naval gunfire at Salerno. Surprisingly, these "Austers" carry no armament, although the pilot is protected by 100 lb. of armour plate.

What sort of aircraft is the "Auster"? Its rectangular braced wings lack the grace and beauty of a "Spitfire," it has a slab-sided fuselage with a large fin and rudder, its wheels do not retract and are not even spatted. But it is a good solid job throughout, and every part will stand up to the roughest usage that war-flying can hand out. "Austers" usually operate from roads or small fields in the fighting area and are outside in all weathers. And yet, although some of them have well over a thousand hours flying time to their credit, not one has been withdrawn from service through structural deterioration. Incidentally the "Flying Jeep" travels further on a gallon of petrol than its land-based namesake.

No field seems too small for the "Auster." It can take off in 75 yds. and climb 1,000 ft. in one minute. With flaps down and in the face of a 15 m.p.h. breeze it can be landed at 15 m.p.h. Its manœuvrability and angle of climb have to be seen to be believed, and its controls are delightfully light. One "Auster," when attacked over Sicily by an Me.109 made for the nearest tall tree and just flew round and round it in incredibly tight turns until the Hun became fed up and went home.



Taylorcraft "Austers" have a fine record of service in this war as artillery observation aircraft. The latest version of this machine, the "Auster" IV, with 130 h.p. Lycoming engine, is here seen in flight.

The construction of the "Auster" was evolved for ease of production and maintenance. The fuselage and tail unit, which are built up of welded steel tubing, are surprisingly light in weight and none of the tail surfaces has cambered ribs. The wings are built round two spars that are virtually only spruce planks placed on edge, have steel ribs, and, like the fuselage and tail, are fabric covered. The undercarriage is of the simplest possible type and uses rubber cord for shock-absorbing.

The war-time "Auster" is a side-by-side two-seater, as extensive radio equipment has taken the place of the third seat. It has a proud record of service, but Taylorcraft look forward to the day when, instead of directing artillery fire, carrying stretchers or guns, and ferrying "V.I.Ps.," "Austers" will become the "Austin Sevens" of the British skies.

BOOKS TO READ

Here we review books of interest and of use to readers of the "M.M." With the exception o those issued by the Scientific and Children's Book Clubs, which are available only to members, and certain others that will be indicated, these should be ordered through a bookseller. We can supply copies to readers who are unable to place orders in this manner. Order from Book Department, Meccano Ltd, Binns Road, Liverpool 13, adding 6d. for postage.

"THE STORY OF THE WEST HIGHLAND"
(L.N.E.R. 3/6)

With characteristic enterprise the L.N.E.R. have published a further historical booklet, presumably written by Mr. George Dow. This is a splendid companion volume to "*The First Railway in Norfolk*" reviewed in the "*M.M.*" in August last. The present book actually commemorates the golden jubilee of the opening of the West Highland Railway, long since vested in the former North British system and now of course included in the L.N.E.R. This "Road to the Isles," for such it is, forms a most interesting outpost of the kingdom of King's Cross, and its fascinating story is ably told by the author. The book is no mere history directed only to the railway student; it tells the enthusiast practically everything he likes to know about a particular railway, and in addition there is a wealth of well-reproduced illustrations that give the reader a fine idea of the scenes on and along the line, and of its equipment. Many of the features were peculiar to the West Highland, for owing to its geographical situation that line, like the neighbouring Callander and Oban section of the L.M.S., boasts characteristics that mark it as "different" from its owners' main line.

An excellent map of the line appears on the inside front cover, so that we can readily follow the references to the route detailed in the historical survey that forms the first of the four sections into which the account is divided. The West Highland had its origin in a scheme of 60 years ago for connecting Glasgow with Fort William by rail, and an extension was to continue the line through the Great Glen and so reach Inverness. This would have given a shorter route to the Highland Capital than that from Glasgow via Perth, and the scheme was strenuously opposed by the then Highland Railway. As a result the project had to be dropped. In the next attempt the line through the Great Glen was omitted, and in spite of continued Highland opposition the Act was obtained, the work was put in hand, and in August 1894 the line was opened throughout to Fort William. This was the first instance in Great Britain of the opening in one day of a railway 100 miles in length.

The story continues with battles with the Highland Railway, and of ups and downs generally, the line finally being taken over by the North British Railway, which worked it from the start. It never reached Inverness, but was extended to Mallaig, on the coast, and in the second section the engineering features of the route are dealt with. On the section to Fort William bridges and viaducts are numerous but tunnels are not nearly so common as one might expect in mountainous country. On the Mallaig extension tunnels are more plentiful, while the beautiful curving viaduct in romantic Glenfinnan is probably the best known engineering feature of the whole system. Signalling features and various safety devices, including Great Britain's only snowshed, also are described, with the working of the line, and the locomotive section includes details of its engines, from the special "West Highland bogies," with 5 ft. 7 in. wheels, to the most recent type particularly designed for West Highland duty, the "K4" 2-6-0s of the "*Loch Long*" series.

Finally interesting drawings show a typical West Highland station and one of the familiar West Highland bogie composite coaches. There are also a gradient profile and a table of dimensions of the principal locomotive classes.

"BUILDING A REPUBLIC"
By L. LAMPREY (Harrap. 7/6 net)

The republic of Mr. Lamprey's book is the United States, and he has made a fascinating story of its growth from the time of the earliest settlers to the present day, when their descendants are joining in the struggle to destroy Nazi tyranny. He has not written a mere history in outline. Instead he has told plain stories, from records, of great decisions and events, such as the War of Independence and the Civil War; but he goes much deeper than this, for he gives an array of facts and stories that reveal to us the people behind all these events. We are given instances of their desire for independence; we see how the problems of slavery arose and how they were solved; and we are able to follow the growth of the modern industrial era with its amazing mechanical progress. These and many other more homely details help us to understand better the course of United States history and to value its people as Allies. There are five useful maps.

"HAZARDS OF WAR"
By STANLEY ROGERS (Harrap. 8/6 net)

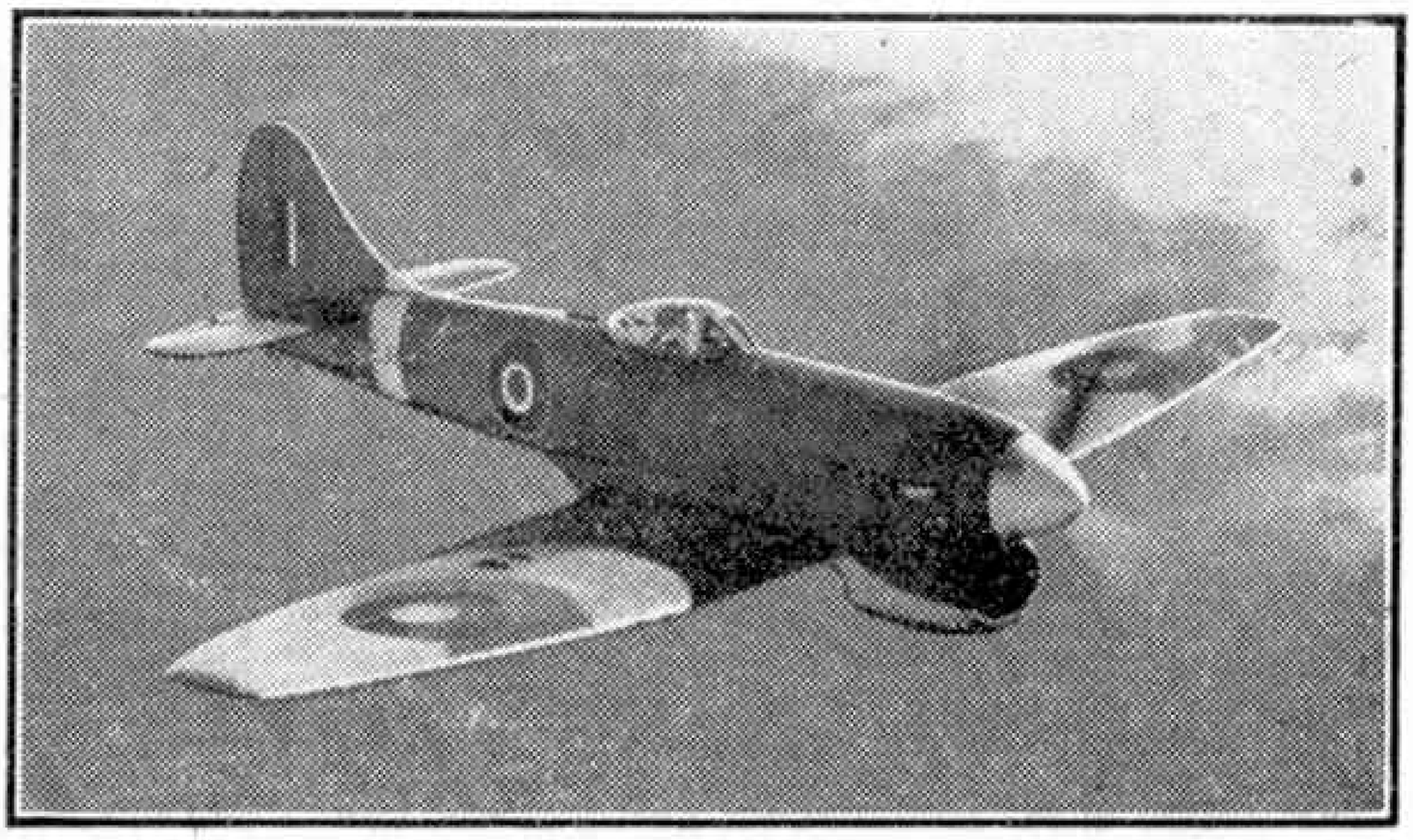
Here is a notable contribution to the stream of books covering different aspects of the war, packed full of stories of heroic deeds, daring escapes, and feats of endurance. We read of the attack by Commandos on Rommel's Headquarters in Libya, of the raid on St. Nazaire, and of the rescue of captured British seamen from the "*Altmark*." Stories of escape from the Germans as they overran one European country after another are told, and from the Far East we get such tales as the escape of General MacArthur from Corregidor, the survival of Ensign Gay after he had blown up a Japanese aircraft carrier in the battle of Midway Island, and the rescue of Capt. Rickenbacker, the famous American flyer, who was lost in the Pacific for 21 days. Other stories of endurance at sea are finely told, including the 34 days' drift on a small raft of Dixon, an American pilot, and two companions, that ended in a landing on a tiny island, with the exhausted pilot urging his weak companions to stand up as they went ashore with the words: "If there are any Japs on this island they'll not see an American crawl."

The book makes stirring reading and is well illustrated with excellent photographs.

"THE CHILDREN'S HOW AND WHY AEROPLANE BOOK"
(Faber. 3/6 net)

This addition to the excellent "Morley Adams" series of children's books tells in simple language and with clear, descriptive drawings the "Hows" and "Whys" of modern aircraft in time of war. Each page of text is faced by a page of illustrations, so that the young reader can see at a glance exactly what is meant. In this way the usual types of fuselages, tail units, flaps, undercarriages, engines, and so on, are briefly explained. Other pages deal with navigation and radio equipment, oxygen apparatus, de-icing equipment, and the parachutes and dinghy carried for emergency use. On the operational side the reader is introduced to the members of a bomber's crew and told of their respective duties, and is given a general idea of how a big bombing raid is carried out. The guns of a fighter aircraft, and the cameras used for air photography also are explained. The final section of the book deals with Air Force badges and medals, tells how they are won and for what they are awarded.

Air News



The "Tempest" the latest Hawker single-seat fighter. This type has been an outstanding success against the flying bombs. Photograph by C. R. Peckham.

First R.A.F. Round-the-World Flight

An Avro "Lancaster" from the Central Flying School, Flying Training Command, is making the first round-the-world flight of an R.A.F. aircraft. The outward stage of the flight, to New Zealand, was made by way of Montreal, Washington, San Francisco, Honolulu, Canton Island and Samoa, and the return will be via Ceylon, Karachi, and Cairo.

The purpose of the flight is stated to be to study navigation and to demonstrate the latest equipment suitable for the Pacific area.

"Golden Hind" Goes East

British Overseas Airways' 4-engined flying boat "*Golden Hind*," shown in the lower illustration on this page, left England recently on delivery flight to East Africa, after having been completely re-equipped at the Corporation's Marine Base. The extensive overhaul included division of the passenger accommodation into four compartments, and the fitting of a concealed emergency escape hatch working on a press-button system. With accommodation for 38 passengers, stowage for 4 tons of freight, and 3,600 gal. of fuel in her tanks—the whole representing a maximum loaded weight of over 33 tons—"*Golden Hind*" is capable of carrying a great variety of loads. If less than 32 passengers are carried one side of the main cabin is arranged as a promenade, so that passengers may lean against a rail and look out of the windows.

The "*Golden Hind*," and the two other "G" Class flying boats "*Golden Horn*" and "*Golden Fleece*," were built in 1939 and were taken over by the R.A.F. to form a Special Duty Flight. During R.A.F. service she was fitted with turrets and depth charges gear, and took part in Atlantic patrols and submarine chasing. She also did transport service between the British Isles and the Mediterranean. After her return to British Overseas Airways in 1941 she was put on the Lisbon shuttle service, and though her normal passenger-carrying capacity is 38, this number was greatly increased when bringing refugees to England. Since June 1943 "*Golden Hind*" has been flying to Foynes, connecting with the Corporation's Boeing arrivals there.

More About "Jet-Planes"

Since the paragraph in last month's "*Air News*" on the Messerschmitt reaction-propelled Me 163 and Me 262 fighters was written a third German machine of this kind has been reported in action on the Western front. This is the Heinkel He 280, which is similar in general layout to the Me 262 but appears to be aerodynamically cleaner than the Messerschmitt machine. The He 280 has twin fins and rudders, and two "jet-units" are carried under the wings like those of the Me 262.

The armament of the Me 262 fighter has now been reported as four 20 mm. Mk 108 cannon, and a 250 lb. bomb can be carried under each wing.

The U.S. Bell "Airacomet" twin-jet fighter weighs rather more than five tons, has a wing span of 49 ft., and is armed with four .5 in. machine-guns.

J.W.R.T.

New Fairey Fleet-Fighter

It was officially revealed last month that a two-seat fleet-fighter aircraft called the "Firefly" is in service with the Fleet Air Arm. It is a product of the Fairey Aviation Company, creators of the famous "Swordfish," and the "Fulmar" and "Albacore" types. The "Firefly" is armed with two 20 mm. Hispano cannon in each wing. It is of 44 ft. 6 in. span, and has folding wings to facilitate stowage aboard a carrier.

London-Liverpool Air Service Resumed

The daily air service between Croydon and Liverpool was resumed by Railway Air Services Ltd. on 13th November last. It is the first civilian air service to be operated to and from London since the war began. De Havilland DH 86 4-engined aircraft, seating 10 passengers, are being used, but the accommodation available for the general public will vary according to Air Ministry requirements for priority passengers. One flight in each direction is made daily.

* * * *

The methods of air-sea rescue employed by the R.A.F. now include the carrying of non-capsizable, fully-equipped life-boats by modified "Warwicks," "Hudsons," and "Fortress" IIs of Coastal Command. The life-boat is carried under the fuselage and dropped by parachute to air crews forced down on the sea.

* * * *

Air Defence of Great Britain, R.A.F., has been renamed Fighter Command, a title made famous by the achievements of the R.A.F. in the Battle of Britain.

British Overseas Airways "G" Class flying boat "Golden Hind." Photograph by courtesy of Short Bros. (Rochester and Bedford) Ltd.

The Snowbound Great St. Bernard

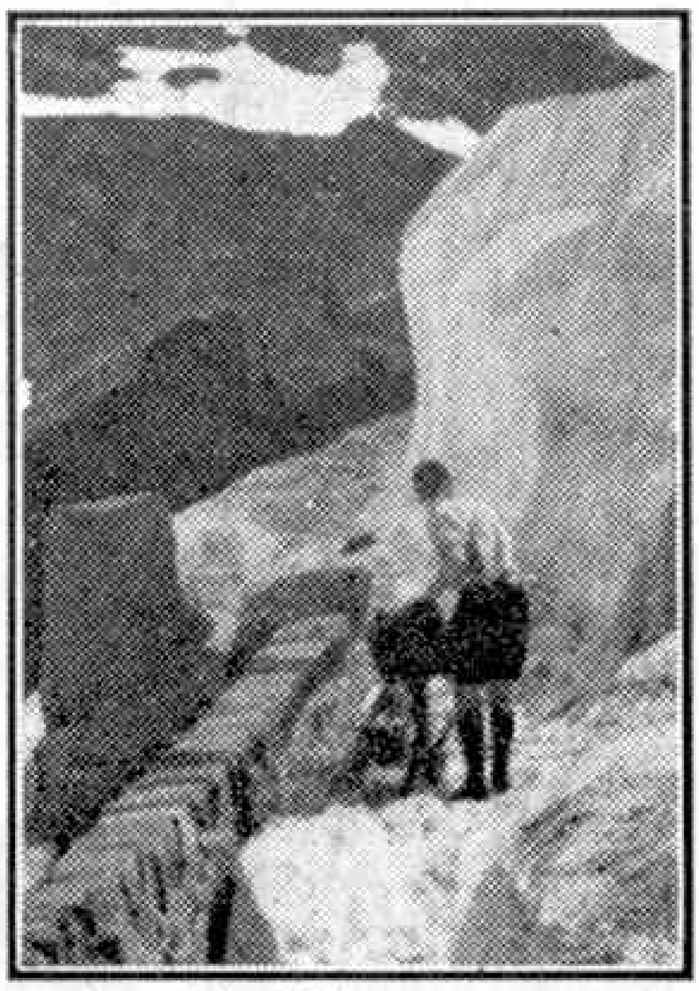
By R. R. Bushell

CYCLING over an Alpine pass at any time is a memorable experience. Let that same pass be snowed up, and it becomes an entirely different story. Early one summer a friend and I crossed the Great St. Bernard under those conditions. It was a distinctly hazardous, and at times unpleasant journey, but all the same we struggled through.

The fun started when, after passing a minute inn, the Cantine de Proz, we reached the first of the snow drifts. But where was the narrow path we were supposed to negotiate? There was no sign of it, and we were forced to throw the bicycles on to the snow and scramble up after them.

That first drift was a real thrill; although the snow was packed quite hard and pushing our machines over ridiculously easy. Here and there the drifts would give way to clear patches of road, and we made up for lost time by riding again. Then we reached the narrowing valley known as the Combe des Morts, or Corrie of the Dead. That was a cheerful place to be crossing, especially as it owes its name to the number of travellers who have died there in avalanches. Now we were forced to edge round sheer drops, where the crust of snow threatened to break and precipitate us into the valley several hundred feet below. Sometimes we had to cross soft, discoloured patches, under which we could hear freshly melted snow roaring downhill to join distant mountain streams.

Slipping and sliding in soaking wet shoes was not our idea of enjoyment, but eventually the Hospice hove in sight, and it seemed to us a safe harbour in that snowy sea. For around the corner, we had been told, were a clear road and a breath-taking drop down the sheer mountain side. We sat down to a very welcome lunch, with an amazing panorama of the French and Italian Alps as dessert. Then we looked round for the Swiss Customs Guard, who eventually appeared from behind a mound of snow, rubbing the sleep from his eyes.



A sticky corner

"Where are you going?" he demanded, taking our passports. We told him. He appeared to be highly amused. "God be with you!" he said, and as if he were not concerned with such lunatics, he nodded sleepily and returned to his hibernation.

The last of the snow was at our backs. Before us stretched the broad highway, now beautifully clear and dry. What a joy it was to move freely once again! We donned pullovers and started what was intended to be a headlong rush to the valley below. We got as far as the first bend, cornered professionally, and and then came to a sudden halt as our front wheels buried themselves in fresh snow. We stared in amazement; there was snow as far as the eye could see, and the road had completely vanished under a solid white mantle that extended from the peaks above us to the valley below. There was one solitary set of footsteps, and gingerly we shouldered our machines and followed them. That is to say, my companion led and I followed.

Presently the single track became a double one, with one branch going steeply downhill. This we followed until we reached a point where the snow was pitted and dirty. Underneath we could hear the now familiar roar of a rushing torrent. Carefully we tried each footstep, fearful of breaking through and disappearing underneath, perhaps to reappear some days later in the Mediterranean.

While we were discussing the next move, we fancied we heard a distant voice which seemed to echo and re-echo across the face of the mountains, to be caught up and tossed from peak to peak. We listened intently and were astonished to hear a voice calling in our own language: "Are you English?" We admitted that we were. "Then go back to the other track!" the voice continued. "That path leads nowhere and is dangerous. You might cause an avalanche."

We climbed directly up the mountain side to reach the other track, heaving our bicycles with us, and finally reached it, somewhat the worse for wear. Most of the time we had been up to our waists in snow, and both had several ugly cuts where we had gashed ourselves on hidden rocks.

It was now becoming necessary to hurry. The Sun had disappeared, and an icy wind was blowing down on us from the peaks, whipping fine snow into our faces. It was getting late, and there was still no sign of the snow ending, while the snow itself was now by no means as easy to cross as at first. The lower we struggled down the track, the softer it became, and we plunged in up to our waists with disconcerting frequency. But the nightmare eventually came to an end. We staggered round a comparatively clear bend, and there in front of us was the black-and-white-striped Customs post.

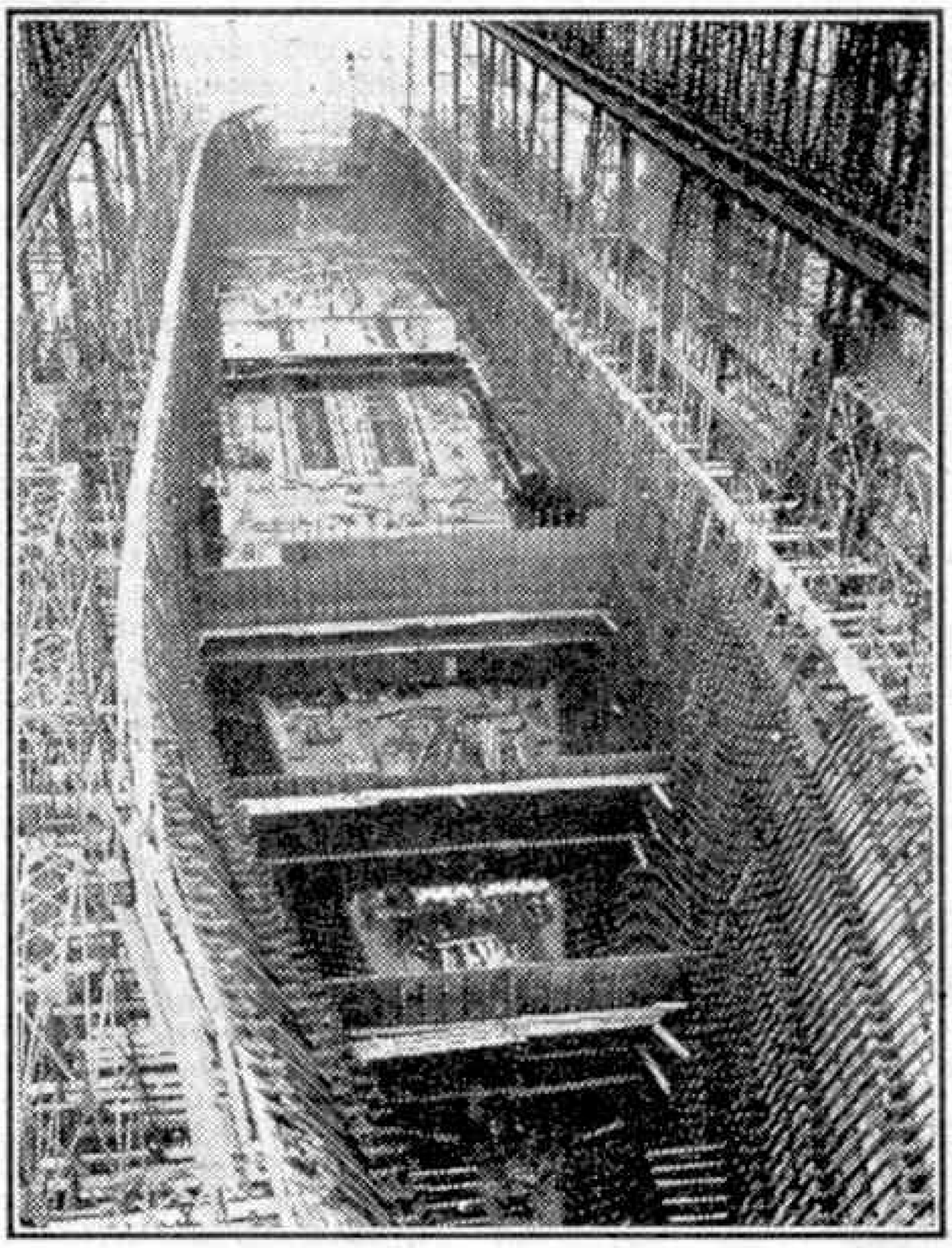
The road on the Italian side of the pass, completely buried in snow.

The Art of Shipbuilding

III—Further Details of Construction

By Denis Rebbeck, M.A. (Cantab.), M.I.N.A., A.M.I.Mech.E.

IN the previous article we saw how the plating of the ship's hull is started, and the term "strake" was explained. A very important point about shell plating is that strakes are alternately raised and sunk; in other words, the edges of every second strake are visible, while intermediate strakes have their edges covered and are flush with the frames. The reason for this alternate raising and sinking of strakes is obvious. The plates must overlap whenever riveted construction is employed in shipbuilding, and it is worth mentioning that one of the many claims made for an all-welded ship is that a perfectly smooth exterior is provided for the hull—the plates in this case being joined by butt welding, that is they are joined end to end without overlap. Welded construction as it is being extensively carried out in the United States is described in some detail further on in this article.



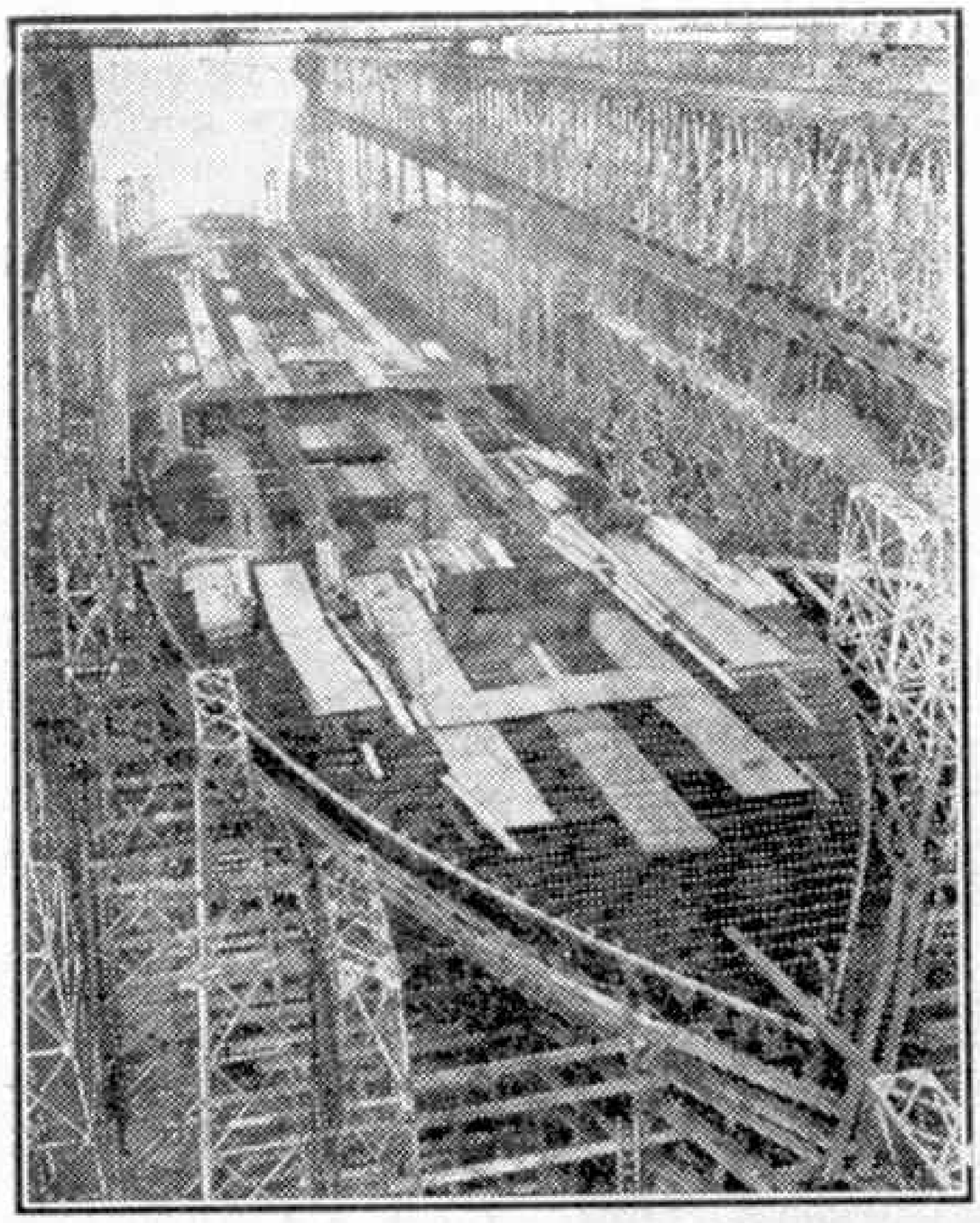
Erecting the main bulkheads.

As the riveting of the shell plates proceeds and each line of rivets is completed, a white line is painted along them to indicate that that particular part has been finished, and this also acts as a check for the ratefixers—the men who assess the amount of riveting carried out by each squad of riveters—and enables them to calculate the workmen's wages. This particular procedure, of course, applies to all riveting completed throughout the ship. The water-tightness of the ship's hull is finally ensured by caulking the edges of the plates, that is, the edges are expanded by a mechanical hammer, with a blunt chisel-like tool, being gradually worked along the plates' edges, and the seams are thus tightly closed. The completion of this particular operation all over the shell plating is indicated by a wavy white band of chalk being drawn along the completed seams.

Meanwhile, the decks and watertight bulkheads are also being fabricated and built up, by riveting and welding plates and sections to vertical girders. The noise inside the hull as all this work proceeds apace is terrific, and must be experienced to be believed. Various openings are left in the decks for the several holds and for finally installing the machinery. In all but the smallest ships, the heavy propelling machinery is not put in the ship until after the launch has taken place, on account of the enormous weights involved.

Every ship, for strength and safety, is split up by several transverse watertight bulkheads and also a double bottom; tragic accidents like the sinking of the White Star liner "*Titanic*" before the last war made all shipbuilders and classification societies realise the absolute necessity for the subdivision of the hull into comparatively small spaces. The shell plating between watertight compartments is further strengthened by longitudinal bars called stringers.

The hull is now rapidly approaching the time when it will be ready for launching, and the construction of the superstructure,



View during later construction.

the deck houses, bridge and accommodation generally is pushed ahead. Reference to the illustrations will show this work proceeding. As the hull is completed, the testing of watertight compartments, such as tank tests, is carried out; the various double bottom tanks and those forrard and aft are filled with water by large capacity pumps situated on the slip, and a careful inspection for watertightness is gone through by the officials concerned. As each tank is checked and passed, the water is run off and the test recorded. High-pressure hoses are used to play water on the numerous sidelights, or portholes, once the glass has been fitted, for the same reason.

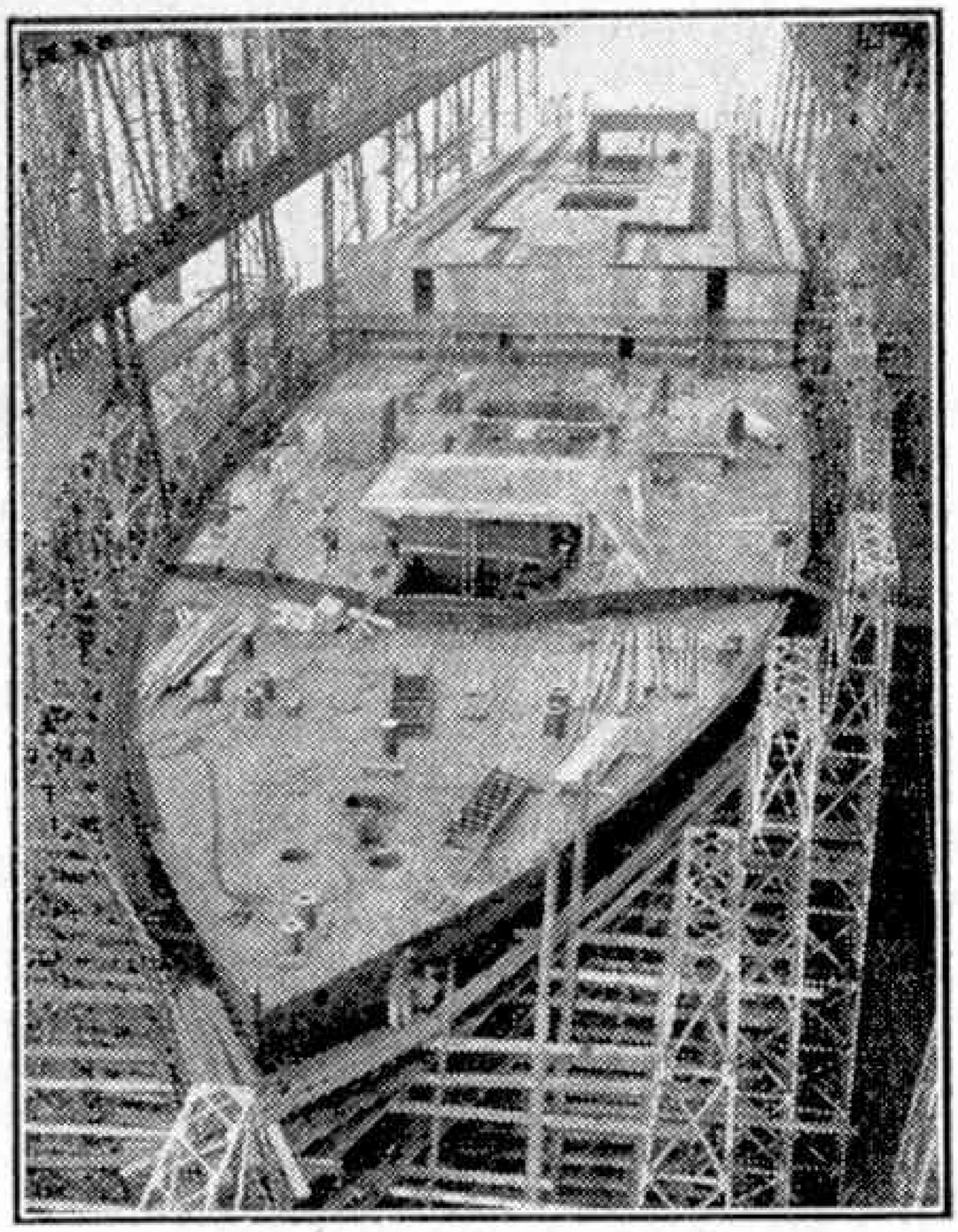
The rudder is carefully lowered into position by a crane at the lower end of the slip, and fitted to the stern frame; the steering gear, which goes in the hull above the rudder post, is also fixed in its particular compartment. Meanwhile the stern tube is fitted, after careful boring out and alignment; the stern section of the propeller shafting, known as the tail shaft, is then fitted, together with the propellers. It is very important to ensure that the tail shaft alignment is carried right through to the bedplate for the engine, which is further forrard in the hull, so that the whole length of shafting, when finally put in place, will run true in its bearings.

The ship is painted both inside and out by a huge squad of painters who carefully go all over the hull; positions difficult to reach are covered by brushes attached to long wooden poles. The first coat is red lead, and the final coats are determined by whatever the particular ship-owning company's colours are. These often have pleasant combinations of colours such as violet above waterline and red below, and many other varieties. The common tramp steamer, however, for obvious reasons, is generally painted plain black, sometimes with a white band at waterline level, but generally without anything to relieve its rather drab appearance.

Finally all is ready for the launching, and the hundreds of workers can rightfully take an admiring last look at the impressive steel structure which they have created.

No article on shipbuilding would be complete without making reference to the use of electric-arc welding as applied to ship construction, especially with regard to the big strides which the yards in the United States have made in this direction.

Modern shipbuilding includes a large amount of welding, and electric welding is becoming more and more a feature of the present-day ship. Because of welding, America has been able to come to the assistance of the Allies by producing a huge fleet of "Liberty" ships in a

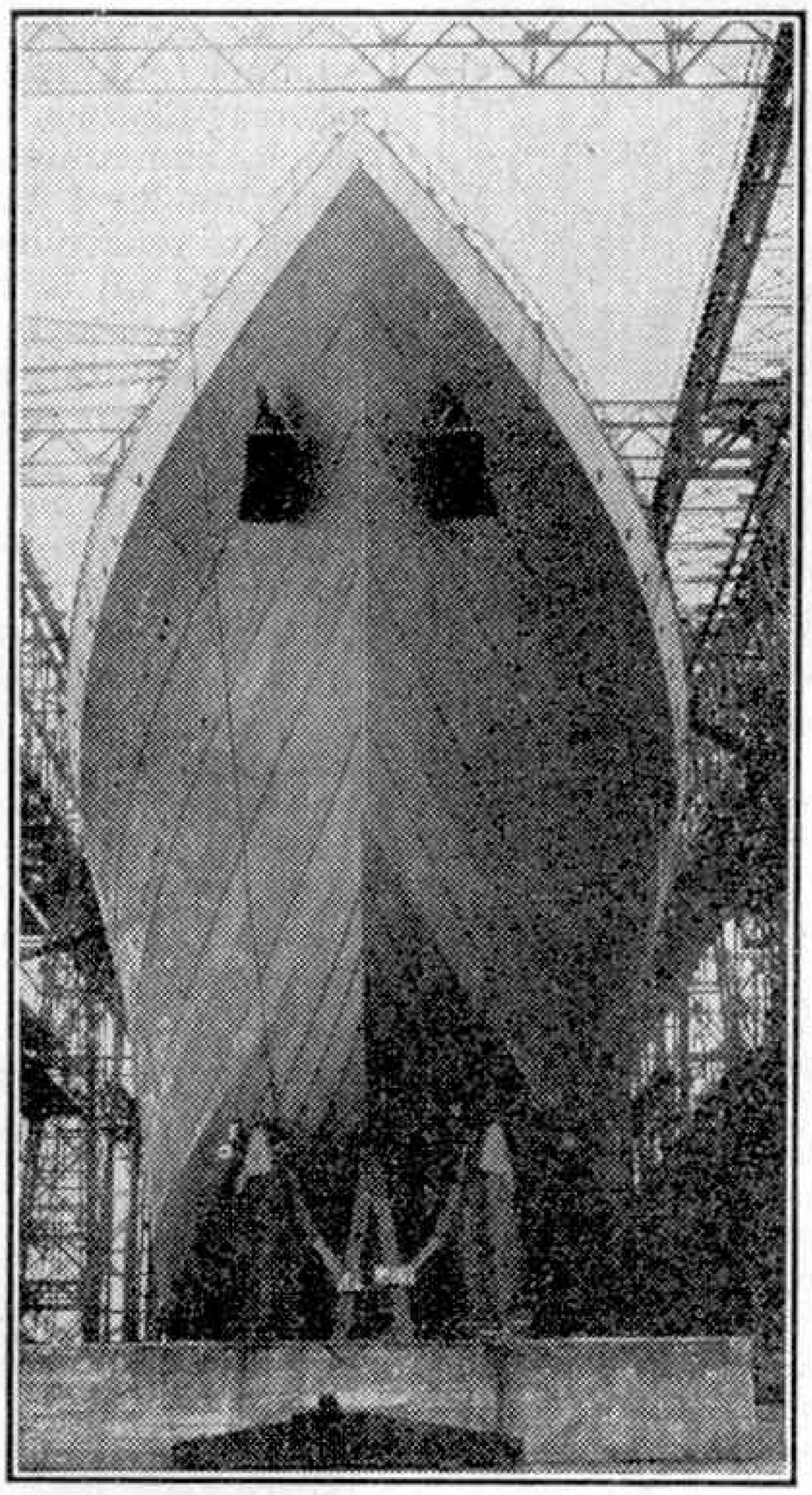


The hull almost completed.

surprisingly short space of time, using workpeople about 99 per cent. of whom had no previous knowledge of shipbuilding. The present American output has been attained by standardisation of design, once the production stage has been reached; by centralisation of materials and fittings, and by pre-fabrication, both of the main hull structure and the various components. As a matter of fact, the actual building of the ship on the slip is merely the end of an assembly line which is supplied by more than 1,200 factories which are situated throughout the length and breadth of the U.S.A.

The first American "Liberty" ship was completed on 30th December 1941, her name being the *"Patrick Henry"*; and the size of these general purpose cargo ships can be gathered from the following data. She is a single screw steamer, length between perpendiculars 416 ft., overall length 441 ft. 6 in., beam 57 ft., and moulded depth to upper deck 37 ft. 4 in. The deadweight carrying capacity is 10,800 tons, and the displacement to the load waterline 14,100 tons. The vessel has two complete decks, a raked stem and an elliptical cruiser stern; eight main transverse watertight bulkheads divide the hull, providing five cargo holds. The main engine is a three cylinder triple expansion steam engine developing 2,500 indicated horse power at 76 revolutions per minute. Frame spacing varies from 30 in. amidships to between 27 in. and 24 in. at the forward and aft ends of the hull. Double bottom construction is used, and there is a solid continuous vertical keel and several intercostal longitudinals.

In September 1941, there were 21 shipyards with about 100 building berths employed on merchant ship construction in the U.S.A., and some idea of the advances made since then can be gathered from the fact that there are now over 70 shipyards having a total of more than 300 slips, the output per day being more than five ships. This figure will very likely be increased to six ships per day! These amazing figures, it will be appreciated, could never be attained if the ships were entirely built on those 300 slips. In actual fact, they are merely assembled there, the time for each ship on each particular slip being about seven weeks.



Bow view before launching.

There is, of course, always a snag somewhere, and in this particular case the cost of the ship is the black spot. In the U.S.A. these new "Liberty" ships are costing about double what they would if built in this country by our methods. This does not matter very much in time of war, however, as speed of production is the all-important factor, but it serves as an indication of the difficulties which American yards will face when competing for tonnage in the world's markets after the war is over.

The United States is at present changing over from the "Liberty" design of merchant ship to a faster type, known as the "Victory" ship, and this of course will for a while affect the output. However, in spite of this change, the delivery of new vessels for 1944 will be 1,799. This total will be made up of about half "Liberty" ships, 339 "Victory" ships, 300 of a cargo ship design known as the "C" type, and 340 tankers. The amazing total output of tonnage from the time when the first real effort was made until the end of 1944 will be about 34,000,000 tons gross. The reader will probably gasp with amazement at these figures, but he must not forget that (*Continued on page 430*)

From Our Readers

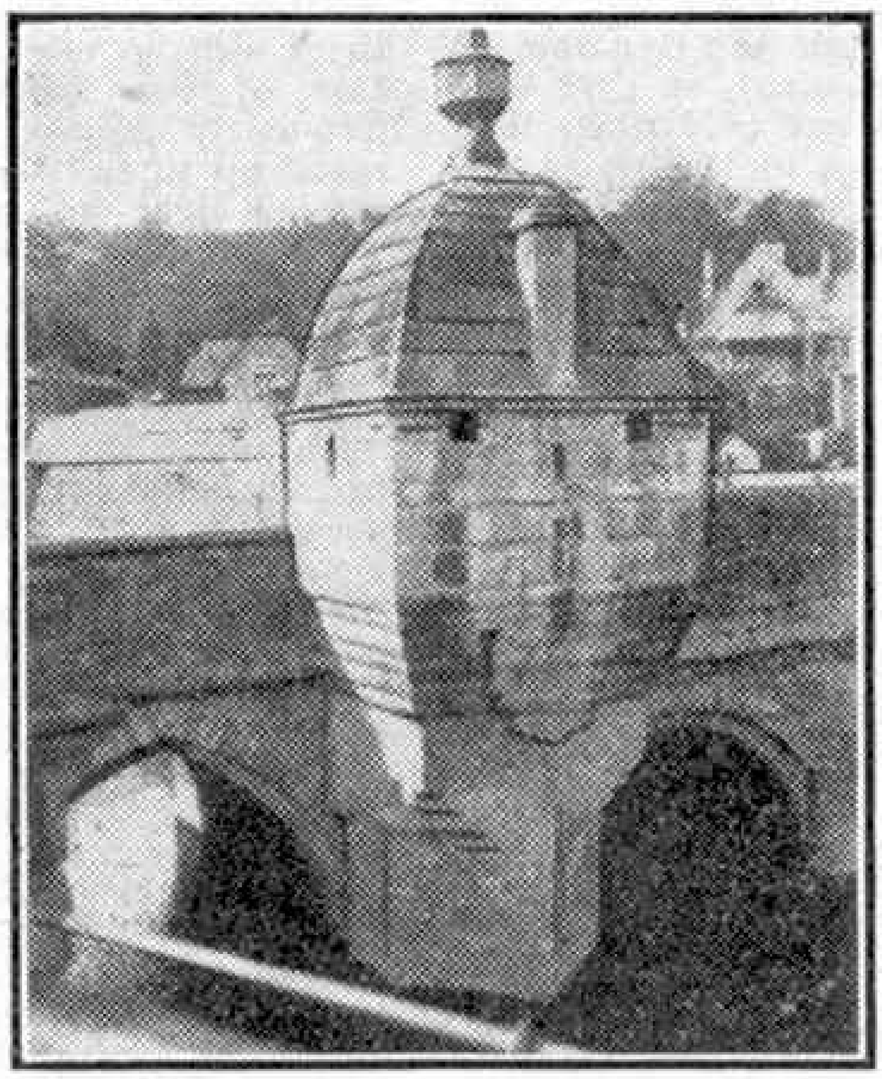
This page is reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of which the writer has special knowledge or experience. These should be written neatly on one side of the paper only, and should be accompanied if possible by original photographs for use as illustrations. Articles published will be paid for. Statements in articles submitted are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

A CURIOUS BRIDGE

In my travels over England I have come across many interesting and peculiar buildings and monuments, but I think for sheer oddity, both of name and appearance, my latest find beats them all. Not very long ago my journeyings took me to the old country town of Bradford-on-Avon, in Wiltshire. During a ramble through the streets I found myself crossing the aged seven-arched bridge, when a remarkable building over the centre of the bridge itself gave me pause. I photographed it immediately, with the result shown at the foot of the page.

I asked for the name of the bridge and was told that it is known locally by what is certainly the queerest name I have ever heard: "Under the fish and over the fish." I could not get any explanation of this from anyone I asked, but I came to the conclusion that it must be because of the fish weathervane which decorates the roof, and the fish in the river below. This is certainly appropriate.

The building has a rather strange history as well as a peculiar name. It was, I learned, first used as a chapel for the celebration of Mass, but later, after the Reformation, it changed its character, as did many other buildings, and was used as a "Blind-house," or in other words, a lock-up. E. BRAIN (Bristol).



A quaint structure on the bridge over the river at Bradford-on-Avon, Wilts. Photograph by E. Brain, Bristol.

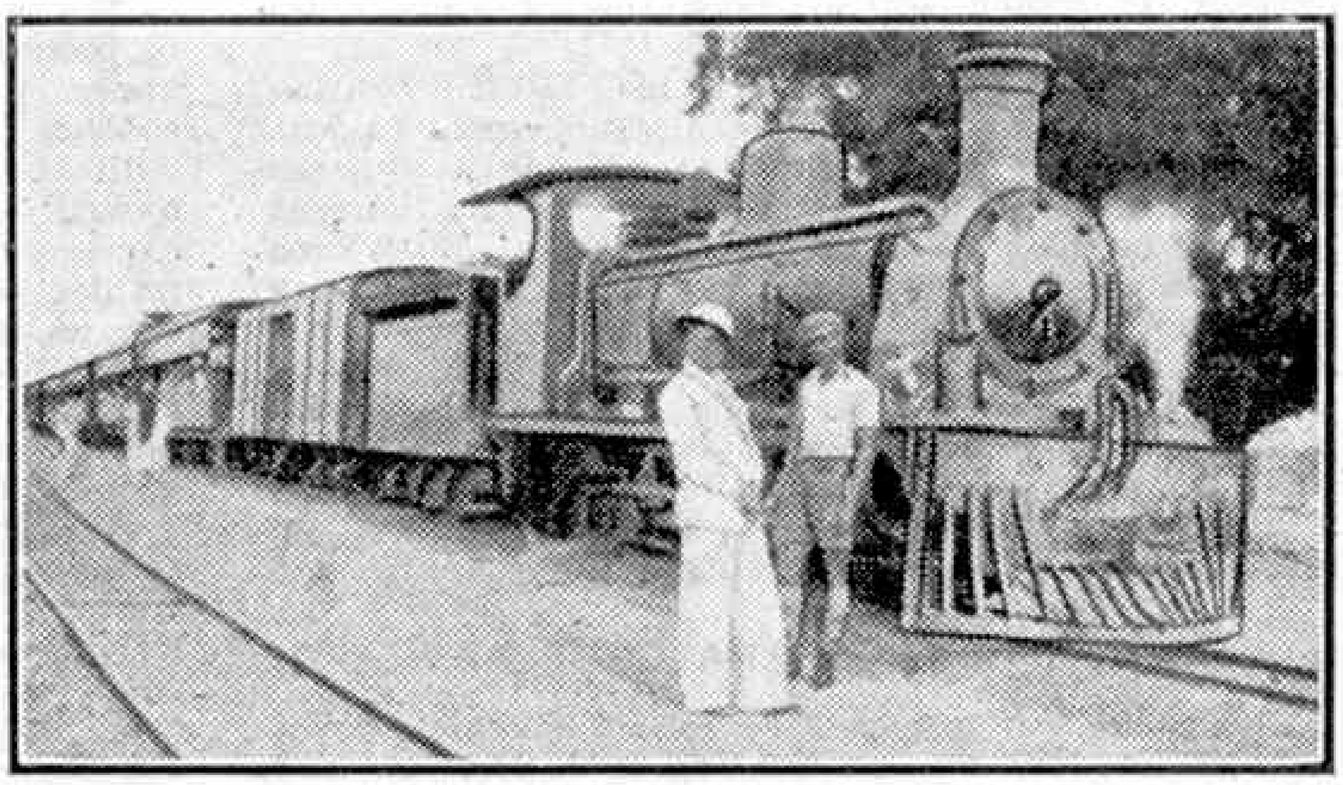
A NIGERIAN LIGHT RAILWAY

During my holidays at Zaria, I visited the Bauchi Light Railway, which gives access to the Bauchi tin fields. The line runs from Zaria, on the main Nigerian line from Lagos to Kano, to Jos, a distance of 133¼ miles. The gauge is 2 ft. 6 in., and engines numbered 51 to 60, with the 0-6-2 wheel arrangement, are in use. The one shown in the accompanying photograph is No. B60, built by the Hunslet Engine Company in 1921. They are all slide-valve engines with side admission ports. This is the only 2 ft. 6 in. railway in Nigeria, the main lines being of 3 ft. 6 in. gauge. It is old, but still in operation, a point of particular interest.

Engine No. B60 operates the Bauchi passenger train on Mondays, Wednesdays and Fridays. Leaving Zaria at 7 a.m., it passes through eight halt stations, eventually arriving at Jos at 8.30 p.m. The scheduled time for the 133¼ mile journey is 13½ hours. The journey is mainly uphill, Zaria being 2,000 ft. above sea level and Jos 4,000 ft., so that the train ascends some 2,000 ft. before it reaches its destination.

At Teria, two stations from Zaria, there is a high siding where the fireman alights with a train staff in his hand, places it in the point box, turns the point and waves the driver all clear. After the last bogie of the train has passed, he once more turns the point, removes the staff and returns to the engine. The object of the high siding is to prevent trains on the return journey from overrunning the station.

Mixed trains work over the line daily except on Sundays. The system reminds one of a model railway, but the receipts are good. H. EKWENSI (Nigeria).



A British light 0-6-2 locomotive on the Bauchi Light Railway, in West Africa. Photograph by H. Ekwensi, Nigeria.

ARGENTINE EXPRESS TRAINS

The finest express engines of the Central Argentine Railway are 20 4-6-2s numbered 1101 to 1120, which are used on express passenger trains, and occasionally on the Buenos Aires-Rosario heavy stopping train. They weigh about 172 tons in working order, with a boiler pressure of 225 lb. per sq. in., and are provided with Caprotti valves. One of the trains they haul has the name "*El Serrano*," which means the Hillman, and runs from Buenos Aires to Cordoba in the hill region of the country. Engines are changed in Rosario. Sometimes "*El Serrano*" is run in two sections, and I remember one day when there were three "*Serranos*."

Among the other named expresses are "*El Rapido*," the Fast One, and "*La Flecha*," The Arrow, both of which travel between Rosario and Buenos Aires; "*El Tucumano*," which runs between Buenos Aires and Tucuman and has air-conditioned coaches; and "*Rayo del Sol*," Ray of the Sun, a night train running between Buenos Aires and Cordoba. The latter runs only four times a week owing to the present wartime conditions, sometimes being made up of 18 sleeping carriages, with the usual post and luggage vans and dining car.

C. T. GODWARD (Buenos Aires).

Have You Ever Thought About This?

How are Railway Carriages Lighted?

RAILWAY travellers may argue about the speed of their train, the relative merits of this or that company's rolling stock, whether the compartment windows should be open or closed, and so on. There is one point, however, on which they will fully agree, and that is when there is a poor light in their compartment. Few probably pause to wonder how the lighting of a train is carried out. No doubt some "*M.M.*" readers have thought about this; some haven't. In either case we hope the following notes will prove of interest.

Although other systems are in use, electric lighting may be regarded as the standard arrangement to-day. It is easy, one might think, to provide a dynamo driven from one of the axles to generate current that can be distributed through the train. With such a simple system, however, the lights would vary according to the speed of the train, and when the train stopped there would be no light at all! Again, trains would have to be made up in "sets," each with a dynamo-fitted vehicle; and the assembly of what we may term a composite train with perhaps a non-electrically fitted vehicle here and there would result in part of the train being without light!

A COMPLETE GENERATING PLANT

Clearly then it is necessary for each vehicle to be self-contained so far as lighting is concerned, and there must be some means of providing light while it is stationary as well as in motion. These requirements are met by providing each vehicle with what is in effect a complete miniature generating plant. Each electrically lighted vehicle carries its own dynamo, which is invariably suspended below the underframe and belt-driven from a pulley on one of the axles. To provide light when the vehicle is stationary and the dynamo is not working, there is a battery of accumulators housed in a box also suspended below the coach.

The dynamo of course must work equally well whichever way the coach is travelling, and it is slung from the underframe in such a way that the belt tension is adjusted according to the pivoting of the bogie and so on. At low speeds the dynamo is unable to generate the current required, so that the battery is relied upon for lighting not only when the train is standing still, but also up to the speed at which the dynamo becomes effective. An automatic switch looks after the change-over from the one supply to the other, cutting out the battery current and cutting in the dynamo, and vice-versa, as soon as the critical speed is reached.

HOW THE CURRENT IS REGULATED

So far, so good; but what of the effect of varying speeds on the dynamo output? The current to the lamp must be constant or the lights will be unsteady, and our friends the travellers will be most annoyed. There is therefore an automatic regulating device that ensures a steady electrical pressure for the lights. The regulator provides for the surplus current being diverted to the battery to keep it charged, and also sees that the charging is stopped when the battery is up to capacity.

The arrangements of the lights and switches in a compartment vary, but most modern vehicles incorporate individual switches so that the passenger may control "his" light as he wishes. Whatever the compartment arrangements may be, the lights in any coach can be switched on or off from the coach itself, and with the electrical system connected up from coach to coach, by means of the familiar "jumper" cables, the lights in the whole train can be put on or off by the guard from his van or any other vehicle.

Electric lighting was first tried many years ago, batteries only being used in some instances, while in others a dynamo driven by a separate steam engine mounted on the tender of a locomotive was employed. The more or less indifferent results of such early schemes, together with the development of the use of compressed oil gas, caused gas lighting to predominate for some time, the gas being carried under pressure in strong cylinders beneath the coaches. At first plain burners were used, and then with the improvements made in electric lighting it looked as though gas lighting was doomed. Then came a partial revival of gas due to the improved results obtained by the use of the incandescent mantle, and gas-lighted carriages are still to be found in use to-day. For some time, however, the tendency has been to use electric lighting for new stock, and many of the older gas-lighted vehicles have been converted to electricity.

With the manufacture of oil gas we are not concerned, but the charging of the carriage cylinders could of course only take place at places where the railway had set up an oil-gas plant. Therefore, while each vehicle fitted for gas lighting had its own self-contained system, it was dependent on visits to the charging points to maintain its gas supply. To supply out stations where gassing was required, but where a complete plant was not necessary, gas cylinder wagons were used. These were fitted with large cylinders or tanks and could transport a good quantity of gas under pressure from a main gas plant to a gassing point.

IN THE "GOOD OLD DAYS"

Coal gas too has been used, and as long ago as 1863 both the Metropolitan and the North London lines had trains illuminated in this way. No doubt this was an improvement on the plain oil lamps in common use elsewhere at the time. The oil lamp was and continued to be for many years quite an institution on our railways. Enormous numbers of them were in use, even though it was not always a case of one lamp to each compartment. Quite frequently indeed compartment partitions did not reach up to the roof and one lamp was supposed to provide light on each side of the partition.

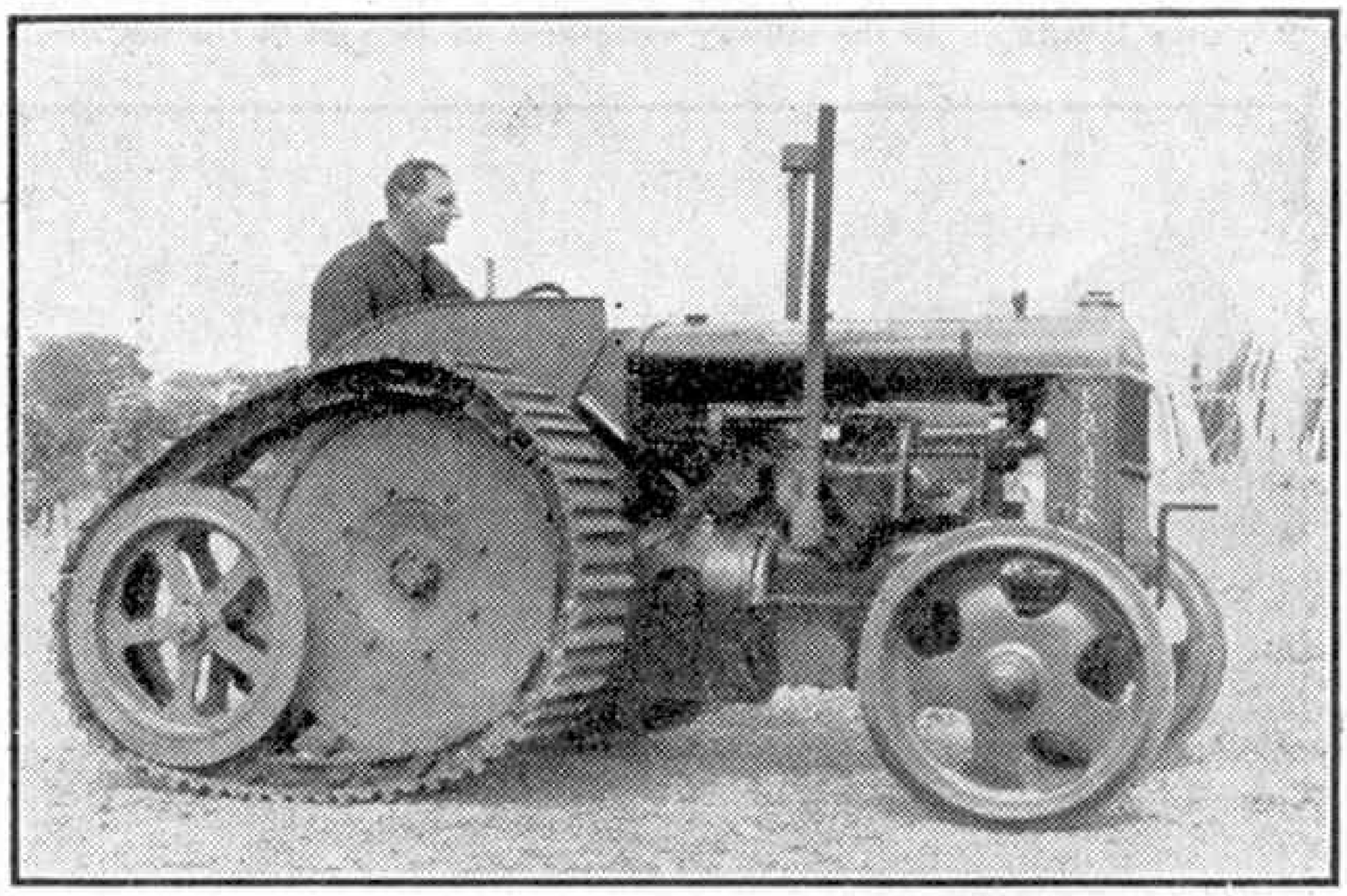
The lamps were separate fittings that were dropped into position through a hole in the roof by the lampman, whose performances along the track roofs were a feature at every terminus and often at large intermediate stations as well. Special lamp rooms were maintained where cleaning, trimming and filling was carried out, and when "new lamps for old" were necessary, barrow loads of fresh lamps were wheeled along the platforms. Fresh lamps were passed up to the man on the roof by his mate with the barrow, on a pole with a hook attached, the used lamps being dropped down by the roof man and caught by the other on the platform. If the lamps already in position on the train were known to be fitted and merely required lighting, this also meant a gambol along the roof tops by a lampman with a kind of lighted torch which he thrust down the chimney of each lamp as he went along. At a brief stop at a junction, especially if the train had to be remarshalled to some extent to attach through coaches in a particular order, the lampman would have a busy time. The characteristic chimneys or lamp tops of coaches fitted with oil lamps are a familiar feature in old illustrations of trains, and even to-day, here and there, one still comes across old vehicles so fitted.

Engineering News

A New Type of Endless Track

In experimental work that is still continuing Roadless Traction Ltd. have devised a new type of equipment for track laying vehicles that is of the greatest interest. A Fordson tractor fitted with this equipment is shown in the illustration on this page. The track is of the locked girder type and the effect of applying it in the manner shown is the same as would be achieved if a wheel of enormous diameter were used.

The larger a wheel the lower the rolling resistance to its movement and the better the performance. This of course has been well known for thousands of years, but there is a limit to the size of the wheel that can be used in practice. For instance, a wheel 20 ft. in diameter of the type required for a tractor would be unduly heavy and would suffer from many other drawbacks. All the advantages of such a wheel can be secured by the use of the new equipment, however, and a glance at the illustration will show how this is effected. The rear wheels of the tractor have been replaced by sprockets, and idler wheels have been placed in position on an axle bolted on the bracket. The tracks are wrapped round the sprockets and idlers, and this conversion can easily be carried out by men without special engineering knowledge in half a day or even less.



A new type of roadless equipment fitted to a Fordson tractor, on which it is equivalent to a wheel of 20 ft. diameter. This equipment is not yet available. Photograph by courtesy of Roadless Traction Ltd.

It will be seen that the track between the sprocket and the idler forms an arch upside down, and the part of it in contact with the ground is in effect part of a huge wheel, in this case of the 20 ft. diameter already suggested. The weight of the tractor is well distributed, half of it being carried by the two sprockets and the other half by the idlers. As the sprocket is in front, the part of the track transmitting the drive is in compression, an important factor from an engineering point of view, as the idler is relieved of loading due to track tension or pull.

The track is locked solid when under load, so there is none of the heavy wear and tear to which pin-jointed tracks are usually subject. A tractor fitted with the equipment steers easily and the pulling power is very high; only in the worst possible ground conditions is it necessary to fit spade lugs, 10 on each side, and then the hauling power of the tractor is limited, not by track slipping, but by engine capabilities. A further advantage is that there are no weight-carrying rollers with bearings that have to be submerged in mud and water. The only bearings that require daily attention are those of the idlers, which are well above ground level and easy sealed.

The trials that so far have been carried out with the new equipment have shown it to be remarkably efficient, and further tests in conditions of all kinds are now being carried out. The equipment will not be available for purchasers until these trials have been completed, and until then Roadless Traction Ltd. are unable to enter into any correspondence regarding them.

Bridge Raised 18 ft.

It is not often that a steel bridge of several spans is raised through a height of 18 feet. This is what happened to a railway bridge across the Tennessee River in the United States. At the point of crossing a great dam had been constructed as part of the schemes of the Tennessee Valley Authority, and the bridge had to be raised in order to stand sufficiently clear of the increased height of the water below it.

The bridge has eight spans, including five of 200 ft. and a vertical lift span of 300 ft., carried on concrete piers that originally were from 50 ft. to 90 ft. high. To begin with the piers were made larger by placing more reinforced concrete round them. Then each span was lifted by means of hydraulic jacks placed under each end, the whole span being raised at the same time. Oak packing pieces were inserted to support the spans after each $\frac{3}{4}$ in. of lift; these were replaced by concrete blocks when the lift had gone far enough, and more reinforced concrete was then poured round the blocks.

Oil in Britain

A war secret that has now been disclosed is that oil production in Great Britain has been greatly increased during the war years. Oil wells were already in existence here when the war broke out. Several areas had then been marked down as likely to produce oil, and borings had been made in them with promising results, which were noted in the "*M.M.*" from time to time. One of the two fields that had given results had then produced nearly 1,000 tons of oil, while the other was producing about 230 tons a month. The men who were engaged in the work were reinforced by American experts and more wells were drilled, with the result that the output was raised from 300 to 9,000 tons a month during 1943.

The work was carried on with great energy, and records in drilling were made. On one occasion an outfit moved to a new site actually drilled to a depth of 960 ft. within 24 hours of the beginning of the removal. There are no spectacular "spouters"; the oil is brought up by pumps operated by silent electric motors. One result of this is that the sites do not advertise themselves by the presence of oil and by offensive smells. The oil itself is of good quality, yielding paraffin waxes, lubricants, and other petroleum products in addition to petrol. Further interesting developments are expected.

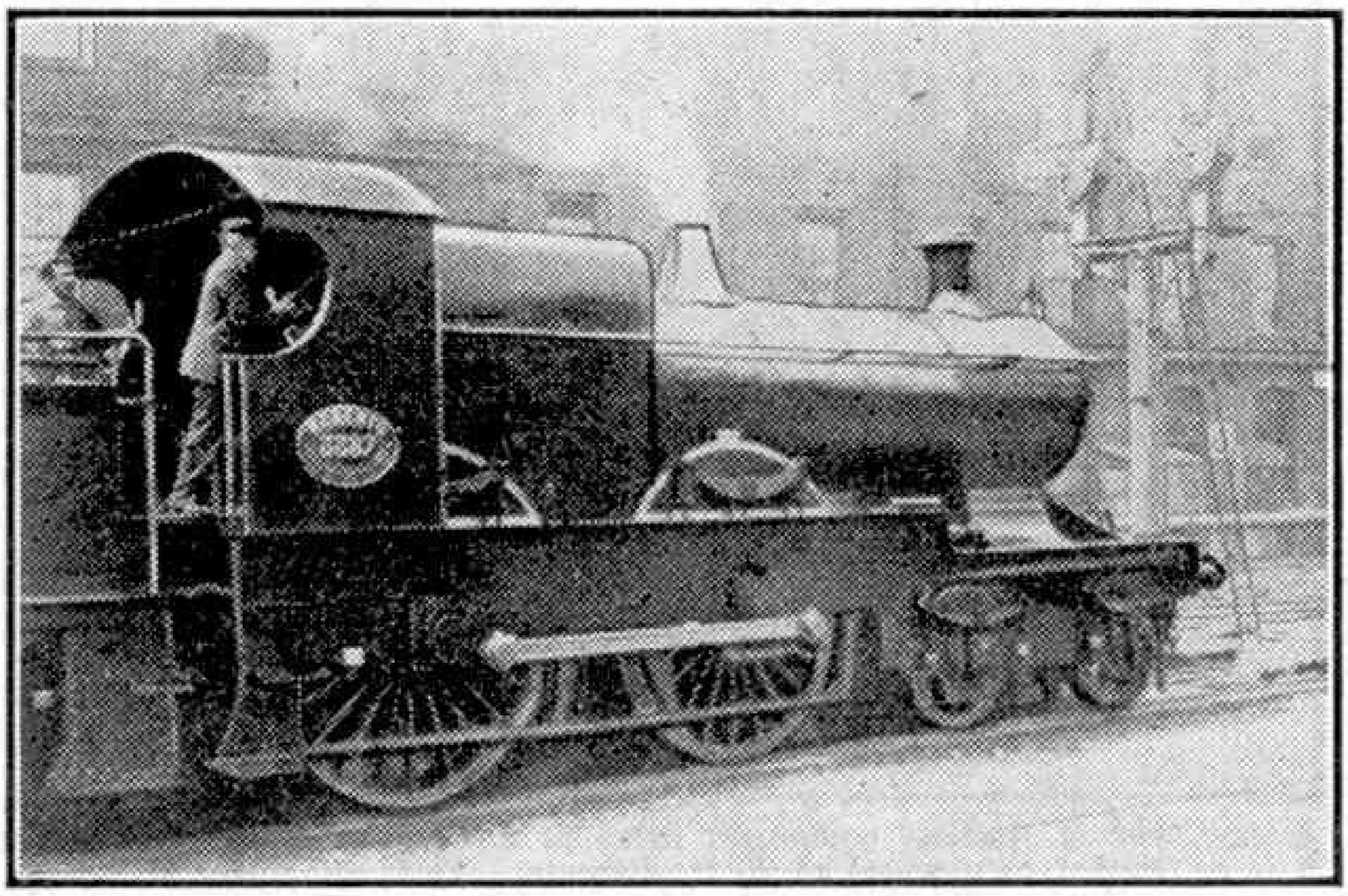
Railway News

Great Western Notes

We are able to reproduce a fine old photograph of one of the characteristic express passenger 4–4–0 types, now extinct. No. 3387 belonged to the "Atbara" class, introduced in 1900, with parallel boiler, square-cut outside frames and outside bearings. The inside cylinders were 18 in. diam. by 26 in. stroke; working pressure 180 lb. per sq. in. Numbering commenced at 3373; the names, appearing as part of the brass number plate, were of places or men prominent in recent British Empire history at the time, and the one illustrated was named after Field Marshal Lord Roberts. In course of time the numbers were changed to 41xx; taper boilers were provided with superheater and, in some cases, increased pressure; all were scrapped by 1931.

Other inside cylinder 4–4–0s with 6 ft. 8½ in. driving wheels were the "Badmintons," "Cities," and "Flowers"; then there were also the "Counties," with outside cylinders, but the only representative of these classes existing to-day is the *"City of Truro,"* which in normal times is exhibited at York Railway Museum.

Mr. H. W. Jones sends details of a curious operating feature on a Cardiff suburban line where there is a station, or rather halt, with two tracks and trains in each direction, yet passengers can only travel from it one way! The halt is Woodville Road, on the former Taff Vale route from Cardiff, Bute Road and Queen St. stations to Maindy Halt and Llandaff; at the halt there is a platform adjacent to the north-bound line only, so that a traveller wishing to go from there to Queen St. must first go in the wrong direction to Maindy, stay in the train and come back past Woodville Road on the southbound track. Similarly a journey from Maindy to Woodville Road has to be made by way of Queen Street, then back again. The local trains concerned are of the "push-and-pull" variety, called "autos" by the G.W.R. and worked usually by one of the modern 48xx branch 0–4–2T type locomotives, or by a veteran 2–4–0T, No. 3597. No. 3590 of that once cabless, but speedy suburban class of Victorian days has just been withdrawn.



At Paddington in 1901. "Atbara" 4-4-0 No. 3387 "Roberts" in its original style. Photograph by R. Brookman.

The North and South-West Junction Railway

Readers travelling near London may have observed ex-London and South-Western passenger or goods engines, and also modern S.R. locomotives, working freight or special trains into the yards adjacent to the L.M.S. (Midland) main line at Brent Junction, Cricklewood, or similarly into the L.N.E.R. (G.C.) yard at Neasden. Again, they may have noted L.M.S. through running on to the G.W. main line near Acton, and in each case may have wondered "how they get there."

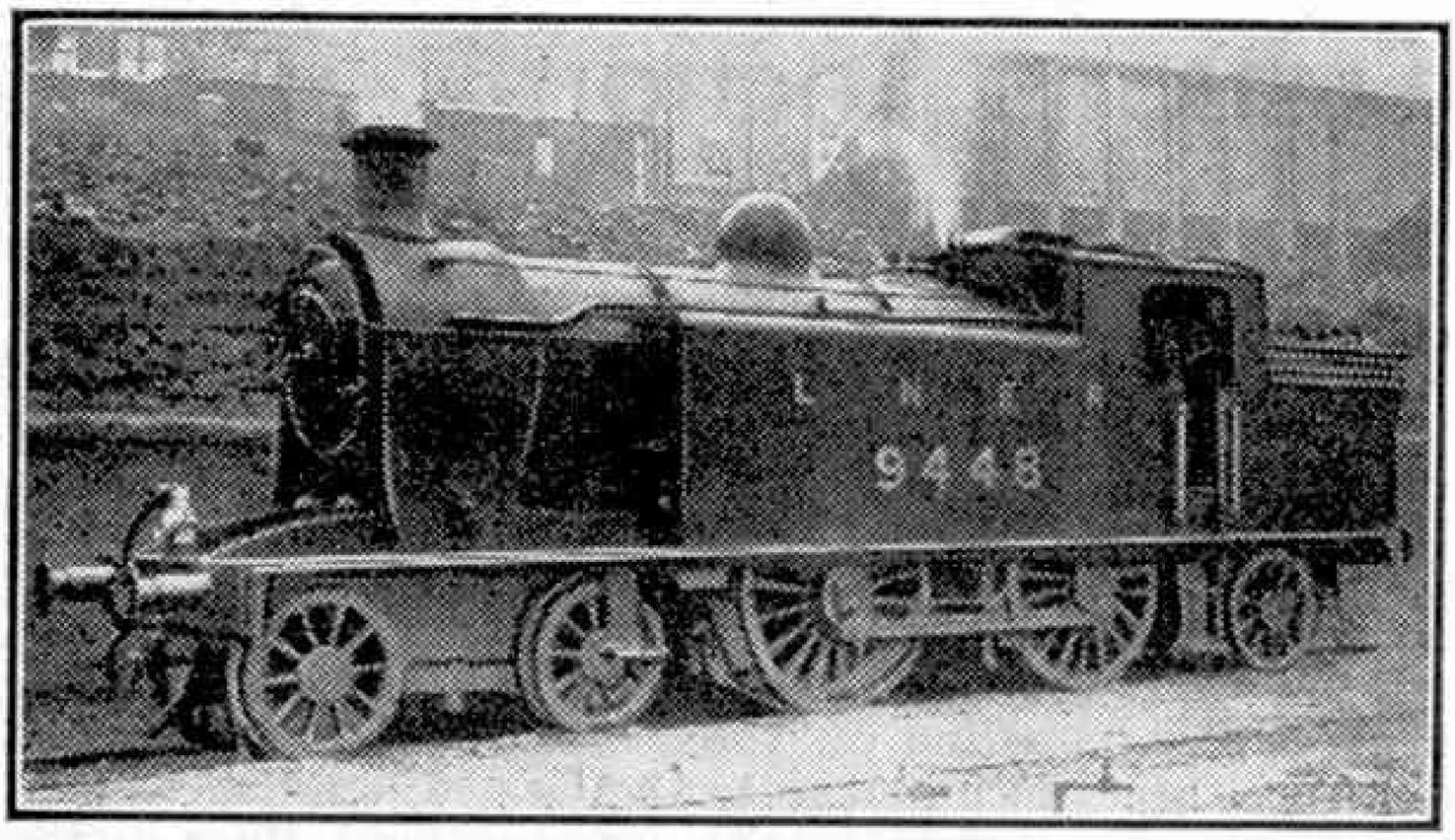
In addition to the cosmopolitan West London Railway described last month, there is another roughly parallel north-south connecting link on the west side of London, called the North and South-West Junction Railway, which provides many connections. It is now partly L.M.S. property and partly Southern. At Kew it joins the latter company's Hounslow loop line, by that means linking many parts of the Western Section, formerly London and South-Western Railway, with other systems. Trains proceeding from there to Cricklewood or Neasden branch off at Acton Wells Junction on to what was a branch of the Midland line, used by suburban passenger trains up to 1904; from that branch a spur goes off to effect the link with the L.N.E.R. and also with the former Metropolitan joint line, at Neasden. The other fork from Acton Wells crosses over the main west and north main lines of the G.W.R., with which there is a physical connection near Acton G.W., and then soon reaches the L.M.S. network of tracks in the vicinity of Willesden. There is connection with the West London Railway, and thus there are two high level connecting lines from the Southern to the L.M.S., as well as the low-level route from Blackfriars to Camden Road (Midland Division) by way of the Metropolitan widened line tunnels of the L.P.T.B., which are also used to a considerable extent by L.N.E.R. (G.N.) freight trains.

L.M.S. electric passenger trains run from Broad Street, City of London, to Richmond, Surrey, via Willesden High Level and the North and South-West Junction line, operating from Kew to Richmond over S.R. metals. Prior to 1916 this was a North London-London and North-Western steam service. It is a rather roundabout route, though interesting to the railway enthusiast on account of the numerous glimpses of other lines and trains obtainable *en route*. South of Acton the junction line connects with several routes owned by the L.P.T.B. or S.R. over which District and "tube" trains run, and also with goods branches to Hammersmith, etc. Standard L.M.S. 0–8–0 and 0–6–0T freight engines are seen among others working to such depots.

Locomotive Doings

More "Austerity" 2–8–0 freight locomotives built under the auspices of the Ministry of Supply are coming into traffic, numbered 8xx and also in other series already announced. In addition, there are now many carrying five-figure numbers, such as 77,129, indicating that the original or intended number has had 70,000 added to it. Some 2–10–0s have recently been renumbered in the same way, while some of the W.D. 0–6–0T engines now carry 75xxx numbers.

A batch of Southern locomotives is being returned from loan to the L.M.S., including "F1" 4–4–0 tender engines and Eastern and Central section tanks. Some have been hauled "dead" in up L.M.S. goods trains bound for Willesden, thereby providing extraordinary contrasts in locomotive type and age. For instance, a veteran Brighton "D1" 0–4–2T was seen next to a U.S.A. 1941 2–8–0; and the 70-years old



The former North British 4-4-2T, now L.N.E.R. "C16" No. 9448. Photograph by F. Moore.

No. 2605, beautifully cleaned, was towed by one of the latest Stanier "8F" 2–8–0 monsters. No. 2605 was originally the diminutive L.B.S.C. 0–4–2 tank "*Streatham*."

While attached to the L.M.S., Stroudley "D1" tank No. 2232 appears to have become a casualty, as it has been withdrawn from the active list. Another stout old engine withdrawn is No. 1249 of the "F1," former South-Eastern 4–4–0 class, an example of which we recently illustrated. The first S.R. "E4" to go is No. 2483, of a numerous local goods and passenger 0–6–2T type first introduced at Brighton in 1897, with 5 ft. driving wheels. No. 2403, which belongs to the slightly newer and more sturdy looking "E5" class of similar engines, though with 5 ft. 6 in. driving wheels, is also down for scrapping. More "Pacifics" are under construction at Eastleigh.

North British 4-4-2 Tank Locomotives

In our short account of the former North British Railway and its locomotives last month, in recognition of the centenary of that Company's incorporation, further reference was promised to the 4–4–2 passenger tank classes that are still in service. They are neat and rather handsome locomotives, possessing considerable boiler power together with a good turn of speed. The first 30 were built between 1911 and 1913 by the Yorkshire Engine Co. Ltd., Sheffield, bearing various numbers from 1 to 309. They have inside cylinders 18 in. in diam. with 26 in. stroke, actuated through slide valves by Stephenson link motion, 5 ft. 9 in. coupled wheels, a heating surface, including fire-box, of 1,309 sq. ft., and boiler pressure, saturated steam, of 175 lb. per sq. in. There is a spacious bunker carrying 4 tons of coal. The tractive effort at 85 per cent. boiler pressure is 18,160 lbs. and the weight in working order is 69 tons.

On the N.B. these engines formed part of class "M"; now they are L.N.E.R. "C15." In course of time the valve setting has been altered to allow of more economical working with earlier cut-offs, and new boilers have been provided, with Ross "pop" instead of "lock-up" safety valves. Most of these engines carry a Westinghouse brake pump mounted high up on the right hand side of the smoke-box, though also provided with an ejector for operating the vacuum brake now standard.

The further 21 4–4–2Ts were part of N.B. class "L," but are now L.N.E.R. "C16," having been turned out between 1915 and 1921 by the North British Locomotive Co. Ltd., numbered 438–52 and 511–16. These numbers were subsequently increased by 9,000. The engines are similar in appearance to the earlier batch, but modernised in equipment; in their heyday they were decidedly impressive and powerful, just as the "Atlantics" were. They have cylinders 1 in. larger in diameter; piston valves, Robinson superheater, Wakefield mechanical lubricator and increased coal and water capacity. Some have been reboilered or have received other slight modifications to improve their efficiency. Yet, generally speaking, both series still retain their characteristic appearance though shorn of their bronze-green paint.

They have been supplanted on many of the suburban and coastal residential services to and from Edinburgh or Glasgow by the bigger Gresley "V1" 3-cyl. 2–6–2T class, but are still doing useful work around Dundee, Dunfermline, Carlisle and elsewhere in Scotland. We are indebted to Mr. J. T. Rutherford, M.A., for certain details incorporated in these notes.

Southern Salvage

During 1943 on S.R. premises there were gathered for salvage 879 tons of wastepaper, 45,000 tons of metal, 235 tons of waste straw, 50 tons of rubber and 190 tons of textiles and old rope.

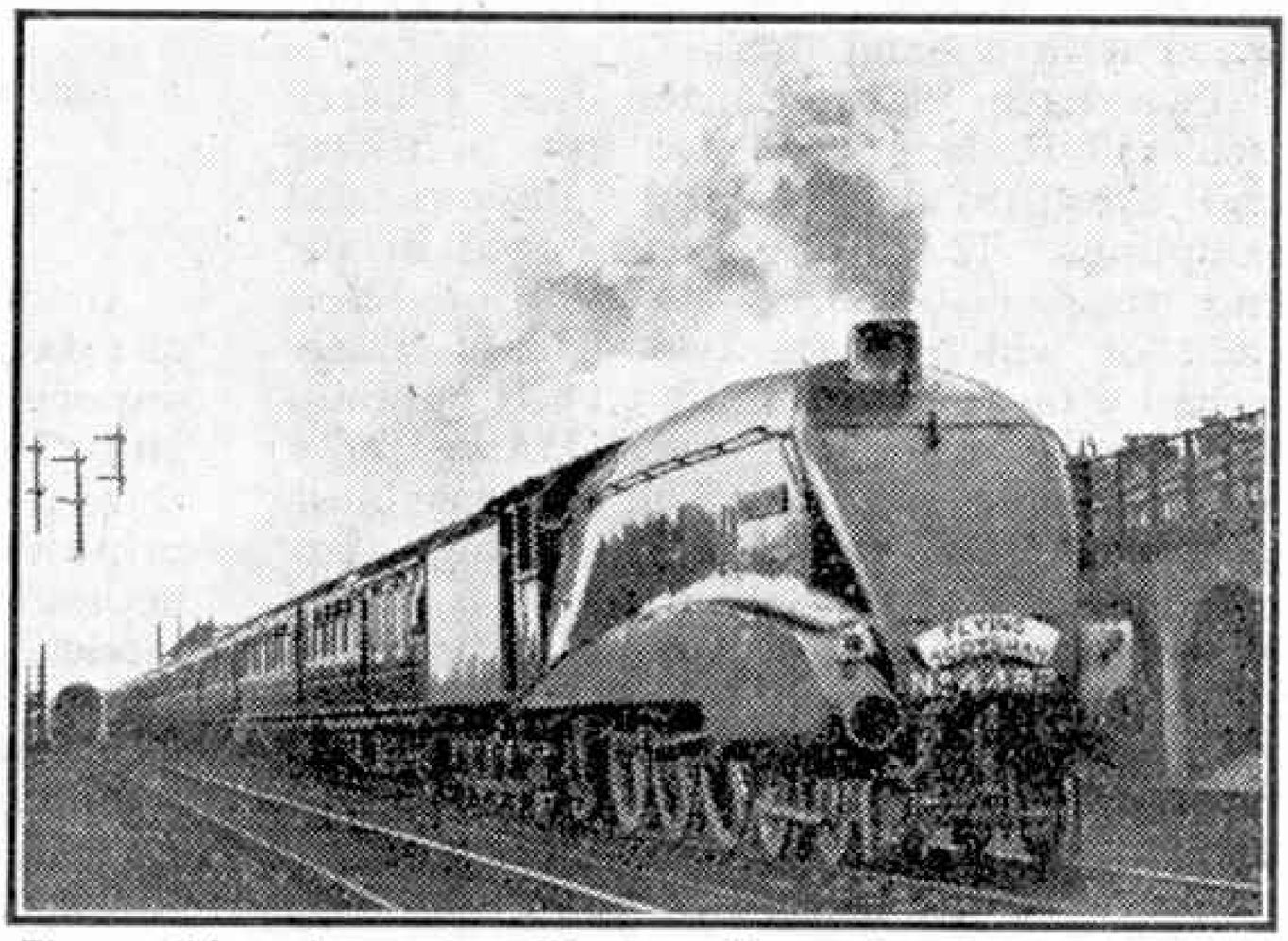
"British Railways—Facts and Figures"

This booklet, published by the Railway Executive Committee, gives numerous facts in brief about the multitudinous activities of the four main line railways and London Transport. Details are arranged in alphabetical order so that reference to a particular subject is easy, and the different items dealt with range from Air Raid Precautions to Workmen's Travel. The booklet in fact provides the answer to practically any railway "Quiz" question that one can think of. In addition there is a chronological list of outstanding events in British railway history.

A separate section is included dealing with finance and statistics, and a very useful glossary of railway items and in connection with various figures is given.

* * * *

L.M.S. "Princess Coronation" No. 6249 has now been named "*City of Sheffield.*"



The northbound non-stop "Scotsman" passing Finsbury Park in 1938, with a new train hauled by "A4" No. 4482 "Golden Eagle." Photograph by Rev. E. Treacy.

Suggestions Section

By "Spanner"

(669) An Automatic Inertia Gear-Box

("Spanner")

The ingenious mechanism shown in Fig. 669, represents a novel gear-box designed some years ago by Mr. H. F. Hobbs, an Australian engineer. It is intended for use in motor vehicles, and its special feature is that it automatically provides gear ratios suitable for the load imposed on the engine of the car under varying road conditions. Its use makes the inclusion of a clutch unnecessary.

The driving shaft 1 and the driven shaft 3 are arranged in line with a short intermediate shaft 2. The driving shaft corresponds to the engine crankshaft in an actual car, and is fitted with two Face Plates, bearings for the Rod being formed by the end plate of the frame and a $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Double Angle Strip fitted between the side Plates. The 2" Rod 2 is inserted for a short distance in the boss of the end Face Plate on the Rod 1, but is free to rotate, and is supported also in a Double Angle Strip fitted between the side Plates. A 50-teeth Gear, a Collar and a Face Plate are fixed to the Rod. The driven Rod 3 carries a Ratchet Wheel, and a Pulley fitted with a band brake.

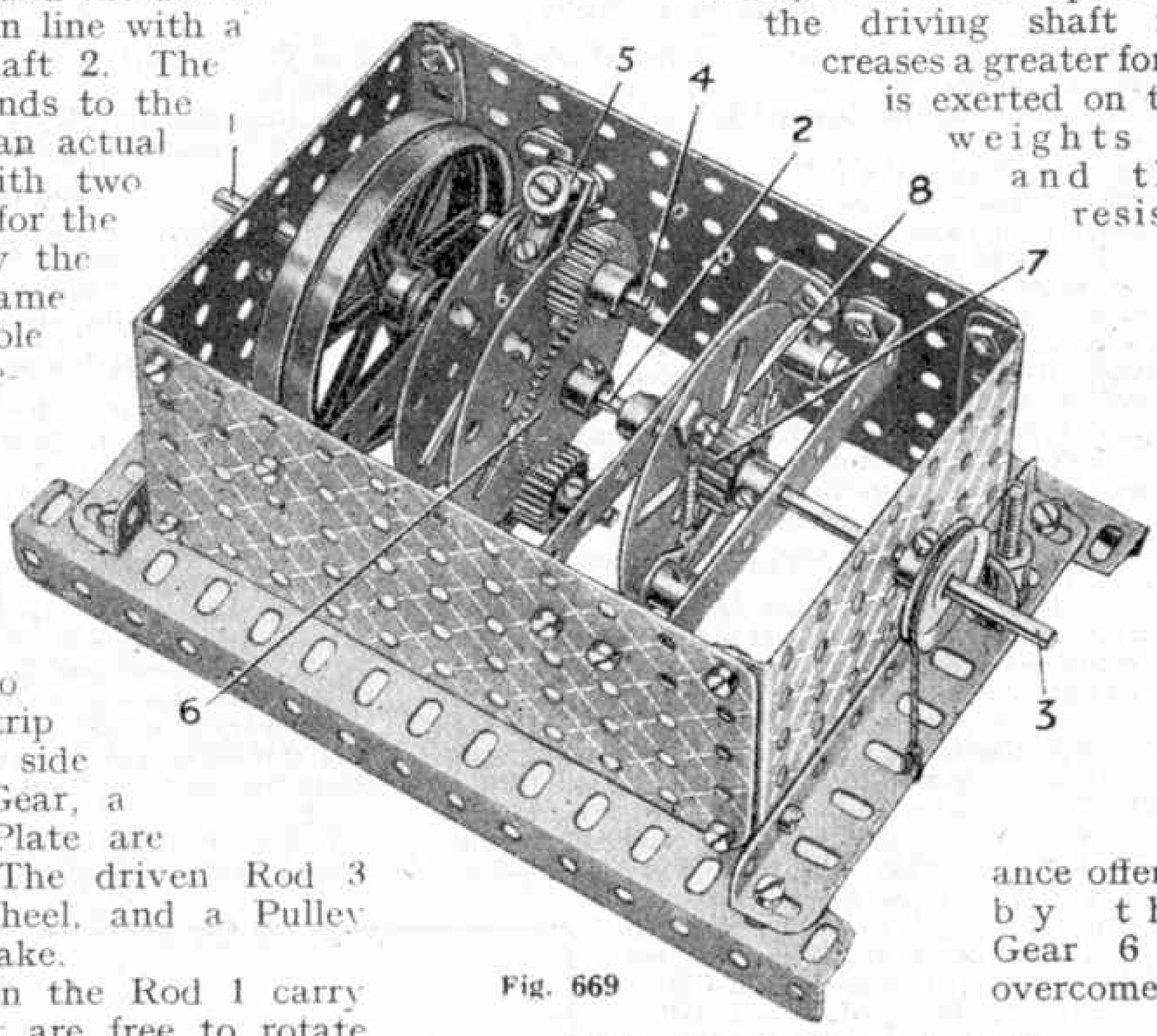


Fig. 669

Two Face Plates on the Rod 1 carry two $1\frac{1}{2}''$ Rods 4 that are free to rotate and are provided with $\frac{3}{4}''$ Pinions and Couplings. The Rods are inserted in the end transverse bores of the Couplings, each of which bears two Collars firmly fixed by means of $\frac{3}{8}''$ Bolts. The Couplings are spaced from the Face Plates by a Washer on each side. The Pinions mesh with the Gear Wheel 6, and when they are correctly placed the weights 5 should be arranged in exactly opposite positions before the grub-screws are tightened up. The correct placing of the weights in relation to each other is very important if smooth running is to be obtained, as any inaccuracy will cause excessive vibration at high speeds.

The Face Plate on the Rod 2 carries two Pawls 8 mounted on Pivot Bolts and held in constant engagement with the Ratchet Wheel 7 by means of Spring Cord. This arrangement serves as a free-wheel and smooths out the drive.

If the shaft 1 is rotated and Gear 6 is held stationary, the planet Pinions will rotate around the Gear, causing the weights 5 also to rotate. Centrifugal force acting on these weights imparts a series of impulses to the Gear 6, tending to turn it first in one direction and then in the other; and as the speed of the driving shaft increases a greater force is exerted on the weights 5, and the resistance offered by the Gear 6 is overcome.

(670) Simple Reversing Gear

("Spanner")

Arrangements for reversing the direction of rotation of a revolving shaft are a very important requirement in mechanical engineering, and there are very few machines that do not include in their mechanism provision for this operation. A like necessity naturally arises in Meccano model-building, which is real engineering in miniature, and there are hundreds of different methods by which reversing mechanisms can be constructed. A good example is shown in Fig. 670, and although this is one of the more simple arrangements it is entirely satisfactory and efficient in operation. Among its uses may be

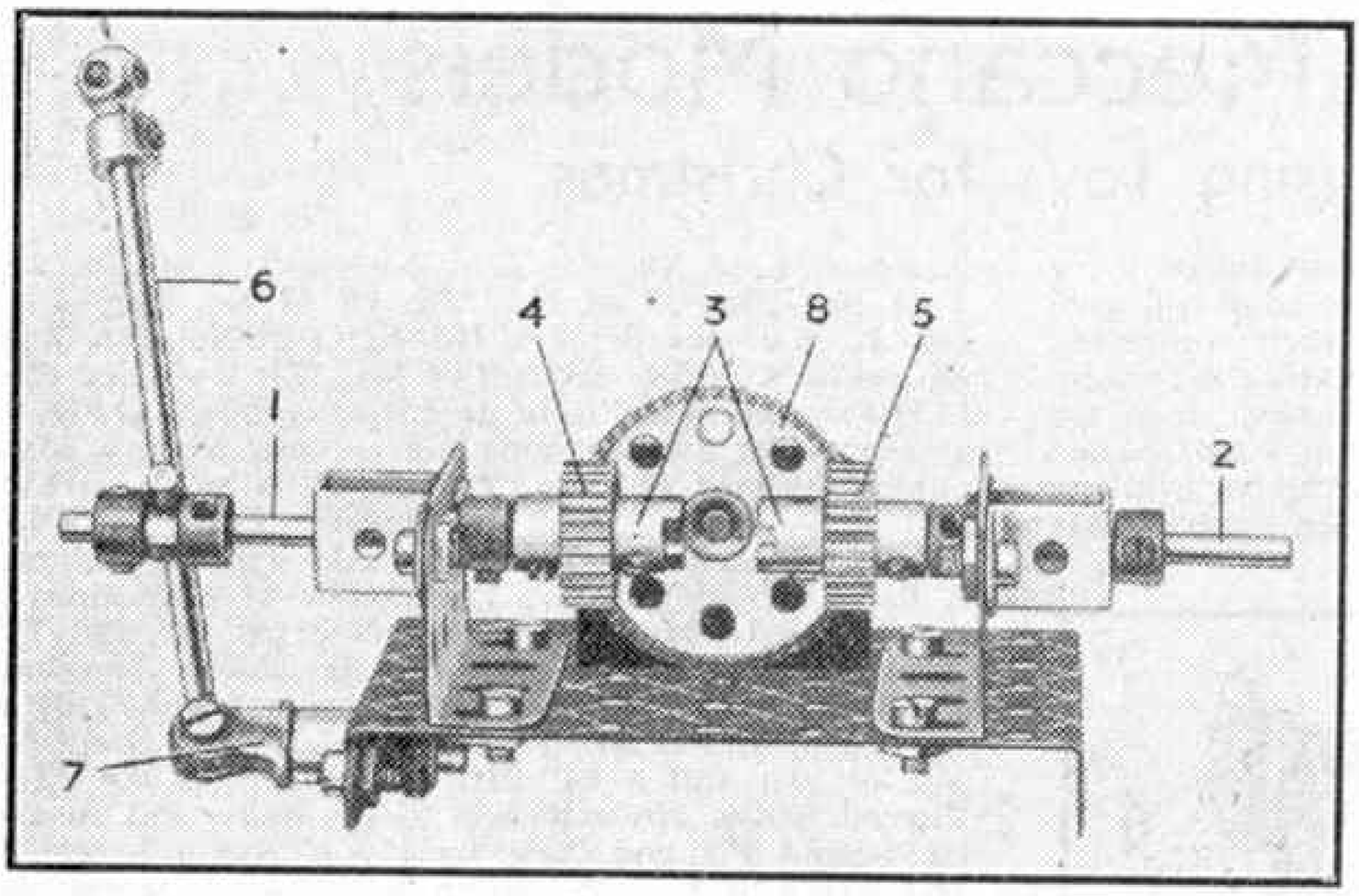


Fig. 670

mentioned that of forming a reversing gear for non-reversing Meccano Motors, such as the No. 1 Clockwork Motor or the E1 Electric Motor.

Referring to Fig. 670, either of the Rods 1 and 2 may be used as the driving shaft. Each carries at its inner end one segment of a Dog Clutch 3 and one ¾" Pinion 4 and 5. The Rod 1 can be moved endways in its bearings by moving the lever 6, which is pivotally mounted in the End Bearing 7 and carries a Threaded Pin held in a Collar. The Pin engages the Contrate 8, but when it is pushed over to the right the Pinion 4 disengages the Contrate and the two segments of the Dog Clutch combine. The Pinion 5 remains in constant mesh with the Contrate, and when the Dog Clutch is engaged the Contrate merely revolves idly on its shaft.

(671) A Contributor's Novel Suggestion

(N. C. Ta'Bois, Woodford Green)

N. C. Ta'Bois, who has been a regular contributor to *"Suggestions Section"* over a period of many years, recently submitted two further ideas that he thinks will interest other model-builders. The first of these is a useful stand for a soldering iron. This is shown in Fig. 671, and is constructed quite simply from a few Meccano parts.

Two 5½" Strips are fixed by nuts to each end of a 5" Screwed Rod, and the Strips are prevented from "splaying" outward by means of 1¼" Discs bolted to them as shown.

Ta'Bois' second suggestion is intended to overcome the difficulty sometimes experienced in attaching flex wire to a terminal, especially when the connections are frequently moved and remade. He finds that in such cases the strands of the wire become frayed, and either tend to cause short circuits or get entangled with the thread of the terminal and make it difficult to screw home the cap. Both these troubles can be easily overcome by attaching a Flat Bracket to the wire by means of a nut and bolt through its elongated hole. A Washer is slipped on the shank of the bolt. The Flat Bracket can then be attached to the Transformer or Motor by its round hole.

It will be found that if this suggestion is adopted it is an easy matter to connect or disconnect electrical apparatus, but as an additional precaution I suggest that the insulation near the end of the wire be bound with cotton thread to prevent the braiding from fraying.

(672) Spoked Rubber Tyred Wheels

("Spanner")

Although it is not often that spoked rubber tyred wheels are required in Meccano model-building, there are some models that cannot be completed realistically without them. Fortunately it is quite easy to assemble a spoked tyred-wheel from existing Meccano parts, the method being as follows: A Wheel (Part No. 19A) is pushed on the Rod forming the axle, and then a 3" Rubber Tyre is fitted against its rim. A second Wheel is then pushed against the other side of the Tyre.

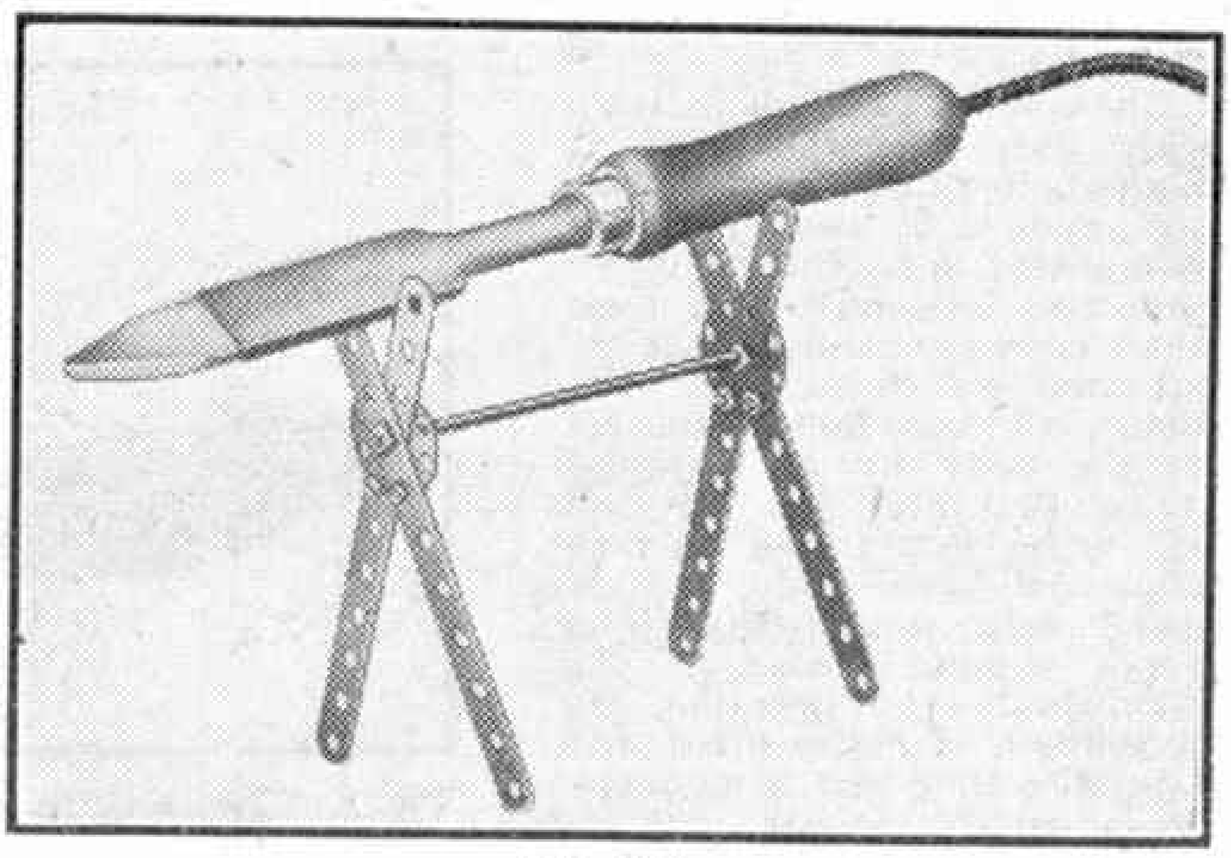


Fig. 671

New Meccano Models

Amusing Toys for Christmas

THIS month we describe the construction of three simple and amusing Meccano toys that will give pleasure to their constructor and when completed will be eagerly welcomed by younger children, especially in these days when ordinary mechanical toys are unobtainable. No doubt many Meccano enthusiasts will be wondering what to give their younger brothers and sisters as Christmas gifts, and we suggest that

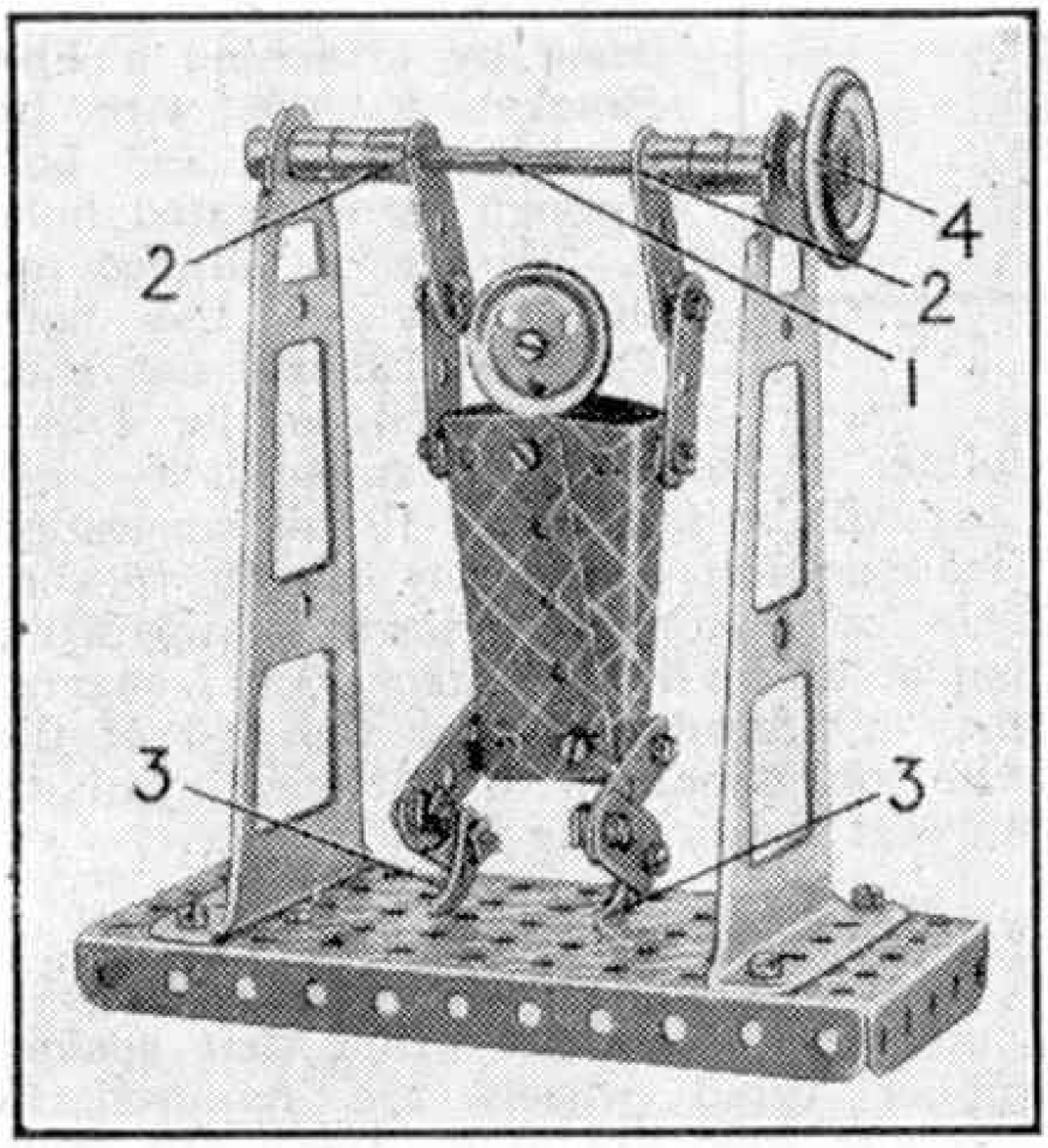


Fig. 1. A simple toy acrobat who performs amusing antics.

they will find these simple Meccano toys ideal for the purpose. Very few parts are required to build the toys, and their constructional details are quite simple.

Fig. 1 shows a simple model of an acrobat who performs many realistic and amusing actions when a handwheel is rotated. The construction of the model is commenced with the base and supports for the bar on which the man performs. These consist of a 5½" × 2½" Flanged Plate to which two large Shafting Standards are bolted to provide the journals for the bar, formed from a 4" Rod 1.

The acrobat's body is built up with two U-section Curved Plates bolted together. His arms are provided by two 1½" Strips lock-nutted to the Curved Plates and also lock-nutted at their outer ends to Cranks 2 that are mounted on the bar 1. His head is a 1" loose Pulley attached to the body by ½" Reversed Angle Brackets. His legs are 1½" Strips lock-nutted to each other and to the body, and are fitted with feet formed from Pawls without bosses 3. The handwheel 4 for operating the model is a 1" Pulley fitted with a Rubber Ring and is mounted on one end of the bar.

Parts required to build model Acrobat: 6 of No. 6a; 1 of No. 15b; 1 of No. 22; 1 of No. 22a; 27 of No. 37a; 19 of No. 37b; 1 of No. 52; 3 of No. 59; 2 of No. 62; 1 of No. 125; 2 of No. 147c; 1 of No. 155a; 2 of No. 177; 2 of No. 199.

The second model to be described is shown in Fig. 2. It represents a man propelling a punt, while a companion reclines at ease. The model is most realistic and amusing in action. It consists of two 3½" × 2½" Flanged Plates, fitted at each side with 3½" Strips. A 9½" Strip 1 joins the lower ends at each side of the Flanged Plates, and further Strips 5½" and 7½" in length are fitted at each side as shown. The man punting consists of two Flat Trunnions joined by a 2½" Strip, and is fitted with a 2½" Curved Strip for his left leg and a 2½" Strip for his right leg. The Curved Strips are attached to his body and to the right-hand Flanged Plate by ½" × ½" Angle Brackets. His left arm is a 2½" Strip bent round across the front of his body and joined to it by a ½" × ½" Angle Bracket. His right arm is similarly joined to his body, and consists of two 1½" Strips Both his arms are lock-nutted at the shoulders and are fixed to collars mounted on an 8" Rod forming the pole.

The passenger consists of a Trunnion 3 bolted to a Flat Trunnion. Two 1½" Strips bolted to each other are attached to the Flat Trunnion to form the right arm supporting the head, and a 2½" Curved Strip 2 forms the left arm, which is shown hanging limply in the water. The figure's legs are 2½" Strips attached to the Trunnion by ½" × ½" Angle Brackets.

The punt is now mounted on three wheels, the front pair being in the form of a roller formed from two ⅞" Flanged Wheels fitted round a Sleeve Piece. The roller is mounted on a 3" Rod 5 journalled in the sides of the punt and covered with a U-section Curved Plate 4 bolted to the front of the Flanged Plate. The single rear wheel is cam shaped, consisting of two ½" loose Pulleys locked together by Flat Brackets, with a 1" Motor Tyre fitted round the pair. It is mounted on a 2" Screwed Rod 6 journalled in Flanged Brackets bolted underneath the rear Flanged Plate.

When the model is drawn along the floor the rear wheel rotates, and its elongated shape causes the rear end of the punt to ride gracefully up and down, while the pole, which trails along the floor, causes the arms of the punter to swing in a realistic manner.

Parts required to build model Punt: 2 of No. 1a; 2 of No. 1b; 2 of No. 2; 4 of No. 3; 6 of No. 5; 4 of No. 6a; 2 of No. 10; 16 of No. 12; 1 of No. 12c; 1 of No. 13a; 1 of No. 16b; 2 of No. 20b; 2 of No. 22; 2 of No. 23; 66 of No. 37a; 56 of No. 37b; 17 of No. 38; 2 of No. 53; 2 of No. 59; 1 of No. 81; 2 of

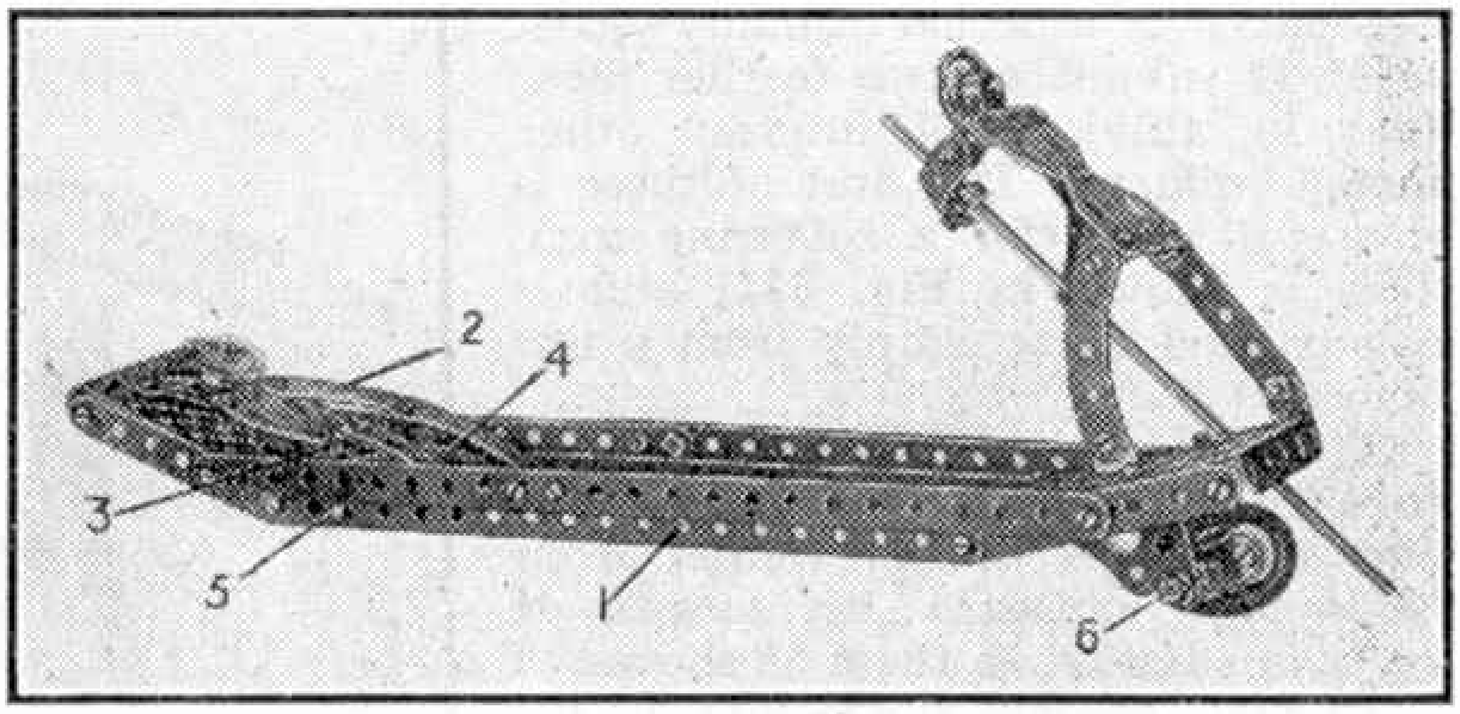


Fig. 2. "Two men in a punt." When the model is drawn along the punt rocks realistically.

No. 90; 1 of No. 111a; 3 of No. 11c; 1 of No. 126; 3 of No. 126a; 1 of No. 139; 1 of No. 139a; 1 of No. 142c; 1 of No. 163; 1 of No. 199.

Fig. 3 shows a simple model of two men strenuously sawing a log of wood. The general construction of the figures is simple and can be followed from the illustration, but the log needs a little description. It consists of three Sleeve Pieces spaced from each other by a ¾" Disc, by means of which they are locked on a 5" Screwed Rod. Between the first and second Sleeve Pieces, however, two ¾" Discs are placed, and these are spaced apart by a nut. In the gap thus formed the saw moves to and fro. The saw is a 5½" Strip fixed to 1½" Strips forming the right-hand forearms of the men, which are lock-nutted to further 1½" Strips pivotally connected to their shoulders.

The saw is operated by a lever 1 formed from a 2½" Strip lock-nutted in the position shown, which is connected by a short length of Cord to the arm of the man on the right. If all the lock-nutted joints are quite free, gentle manipulation of the lever will produce realistically the action of sawing the log. All lock-nuts should be quite tight.

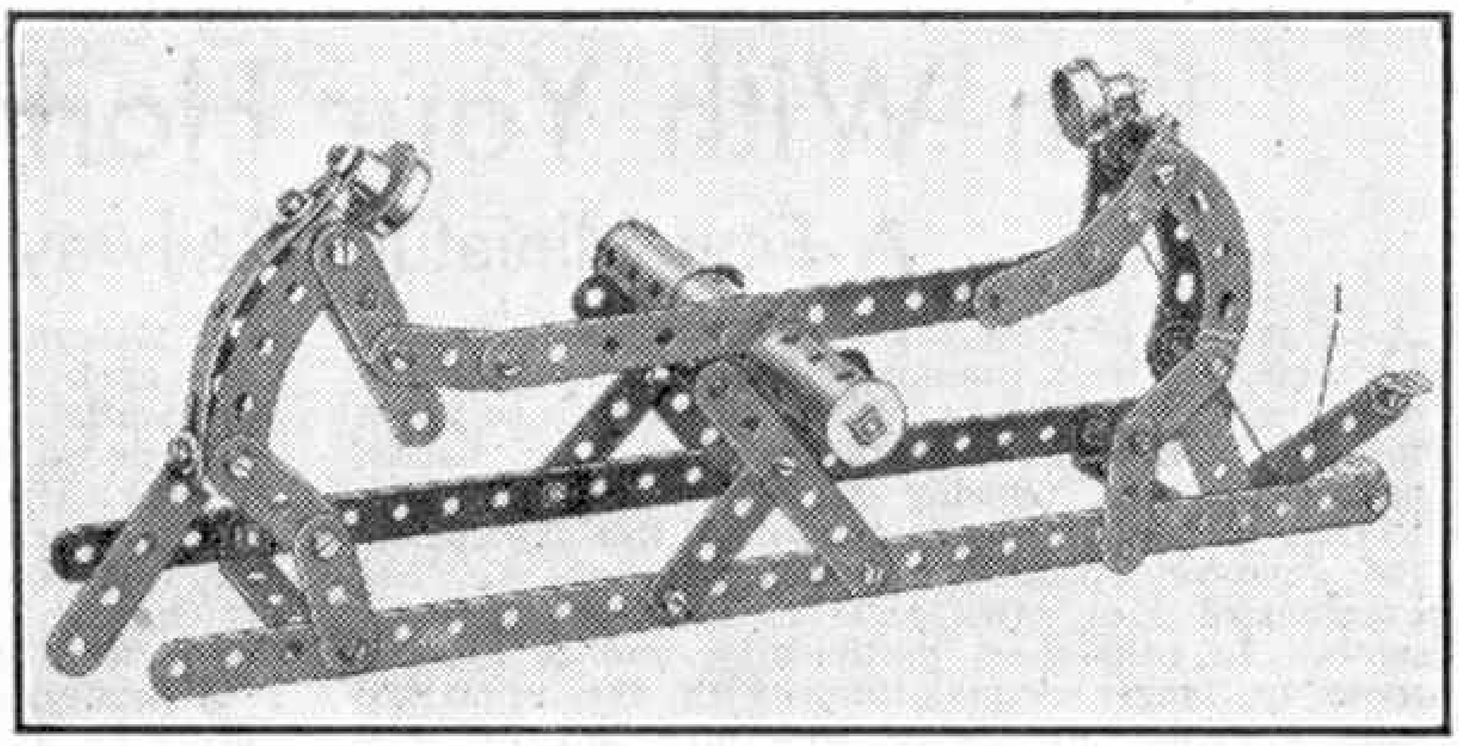


Fig. 3. "Men sawing logs." By operating a lever the figures are made to pull the saw to and fro.

Parts required to make model Woodcutters: 2 of No. 1; 1 of No. 2; 4 of No. 3; 4 of No. 5; 8 of No. 6a; 1 of No. 10; 4 of No. 11; 2 of No. 12; 1 of No. 12c; 2 of No. 20b; 41 of No. 37a; 29 of No. 37b; 5 of No. 38; 1 of No. 40; 3 of No. 48a; 1 of No. 80; 3 of No. 90; 2 of No. 90a; 2 of No. 111a; 2 of No. 111c; 3 of No. 163; 2 of No. 215; 5 of No. 217b.

Model-Building Competitions

By "Spanner"

Can You Make a Meccano Toy?

In last month's issue we announced details of a "Meccano Toy" Competition, and invited readers to test their skill in designing and constructing from Meccano parts, any kind of simple mechanical toy. This competition will remain open for entries until 30th December, so that readers who did not see the original announcement, and who wish to participate in the contest, still have time to submit their entries. There are hundreds of simple mechanical toys suitable for amusing young people that can readily be built up from a few Meccano parts, and three typical examples are illustrated on this and the preceding page.

It should be borne clearly in mind that models must be built entirely from Meccano parts, and all toys submitted must be workable either by pulling a string or a lever, or in some other equally simple manner.

The actual model must not be sent. A good clear drawing or better still a photograph, is all that is required. The illustration should bear the competitor's age, name and address and should be enclosed in an envelope addressed *"Meccano Toy Contest, Meccano Ltd., Binns Road, Liverpool 13."*

The Contest will be divided into two sections, A, for competitors over 14 years of age, B, for competitors under 14 years of age, and the prizes to be awarded in each Section for the best toys submitted are as follows: First Prize, Cheque for £2/2/–; Second, P.O. for £1/1/–; Third, P.O. for 10/6. There will be also Consolation Prizes of 5/– each.

The competition judges will award the prizes for the models that in their opinion are the most amusing when set in motion, and this will be the only feature that will decide a model's chance of success. Competitors therefore should construct their models as realistically and humorously as possible from the parts at their disposal, remembering that the object is a "Meccano toy."

Note the closing date: 30th December.

"Transport" Contest Results

This competition was first announced in the August issue. Competitors were invited to submit models representing any kind of transport, either of bygone days or of the present time, and the fine total of entries received shows that readers generally found the subject of the contest attractive.

The contest was divided into two Sections, A and B, and the successful competitors in each Section are as follows:

SECTION "A": 1st Prize, P.O.'s for £2/2/–: J. E. Meggitt, Ipswich; 2nd, P.O. for £1/1/–: R. L. Herrick, Wotton-under-Edge; 3rd, P.O. for 10/6; J. K. Friend, Peebles. *CONSOLATION PRIZES:* J. A. Fleming, Seahouses, Northumberland; C. Calladine, Nottingham; M. J. Wotton, Bristol; J. Langmaid, New Malden.

SECTION "B": 1st Prize, P.O.'s for £2/2/–: D. Ball, Stoke-on-Trent; 2nd, P.O. for £1/1/–: R. Meadowcroft, Prestwich; 3rd, P.O. for 10/6: J. A. Dale, Paignton. *CONSOLATION PRIZES:* J. Matthews, Fillongley; C. Hyelman, Liverpool 20; W. S. Roberts, Sowerby Bridge; D. S. McIntyre, Newport, Mon.

In assessing the entries on the basis of neatness, good Meccano construction and originality of subject, pride of place is awarded to David Ball, Stoke-on-Trent, for a very fine model of a giant articulated lorry, but he leads by only a narrow margin over R. Meadowcroft, Prestwich, who submitted a fascinatingly real-looking model of the L.N.W.R. locomotive *"Cornwall,"* as it was when in service about 1901. All the essential external features of this fine old "iron horse" are faithfully and skilfully reproduced in the model. Another good effort represents the latest type of aerial transport, a jet-propelled aircraft, and this is the work of J. A. Dale, Paignton.

The best model submitted by competitors under 14 was built by J. E. Meggitt, Ipswich, who chose for his subject one of the 2–10–0 austerity locomotives built for the British Government and now running on railways in this country.

Fun With Your Hornby Trains

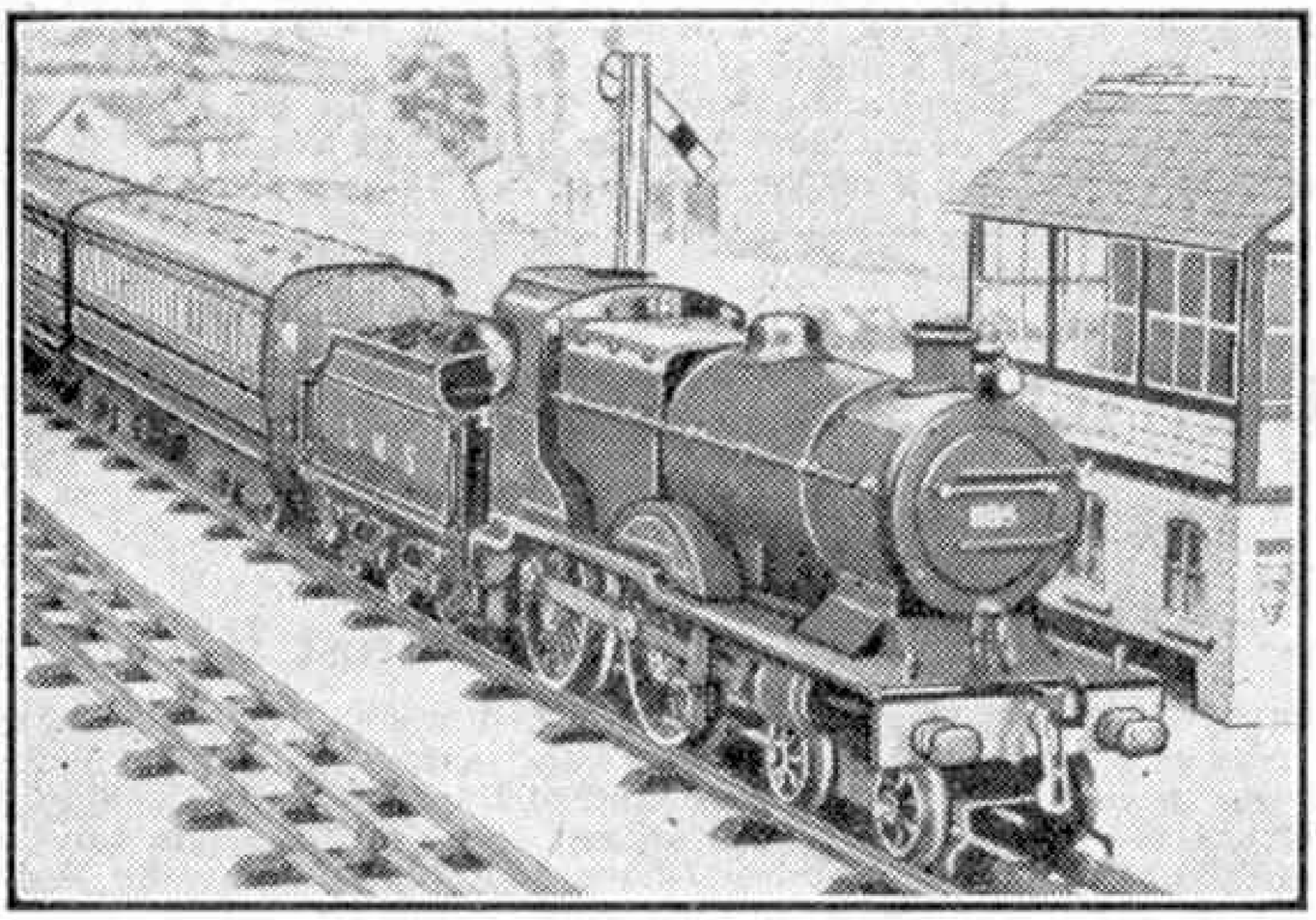
A Few Miniature Railway "Rules"

ALL readers of these pages know the fascination of miniature train running, but not so many realise fully the little "do's" or "dont's" that help so much towards success in operations. The older hands, perhaps without knowing it, apply various "rules" to their train operation as a result of this experience; the younger operators, or at any rate the less experienced ones, often have to find out for themselves. To help them particularly, and to interest those of longer acquaintance with the miniature railway hobby, we give a few hints that we hope will prove useful.

In the first place our track must be good, and the curves and points must be correct for the type of engines and stock that we have to run. By a good track we mean that not only are the rails true to gauge—we can test this with a Hornby engine key as often detailed in the "*M.M.*"—but the line must be laid down properly without any "dog leg" joints; and, on curves especially, there must be no sudden changes of level. As regards the correct curves and points, the radius of these components must be right for our engines and rolling stock. All Hornby engines and vehicles will run on the large (2 ft.) radius curves, of which 12 are required to make a complete circle, six for a half circle, and so on. On the smaller (1 ft.) radius curves, of which six are required to form a circle, and three a half circle, four-wheeled rolling stock only can run. While only the smaller four-wheeled engines are really intended for running on the 1 ft. radius rails, it may be possible to get the larger four-wheeled locomotives to take these curves, but their hauling power, speed and length of run is seriously restricted. When buying separate lots of used material, the only way in these days, it is therefore important to see that we get suitable rails for our engine and train, or vice versa. Bogie engines, their tenders, and bogie-fitted vehicles will definitely not run on the 1 ft. curves.

Correct lubrication is another important point. It is no good obeying the golden rule of "little and often" if we use unsuitable oil. Thick oil of the motor car type is of no use for clockwork or electric engines in Gauge 0, or for the axle bearings of rolling stock; owing to its relatively heavy and gummy nature it will soon have a clogging effect, exactly what we don't want! Therefore, in the absence of the real Meccano Lubricating Oil, a light grade of oil such as is sold for sewing machines or typewriters is essential. But we must not use too much at a time, or we shall get oily wheels, oily rails and poor running. It is better to apply the oil to the various moving parts by means of a dipper—a length of wire will do—than to trust to an ordinary oil can, which may squirt violently an overdose of oil just where we don't want it!

A possible source of trouble in the shape of derailments for no apparent reason is sometimes found in the make-up of a train. We put together a long goods train of mixed vehicles just to show what our engine really can do, and all goes well until the first stretch of curved track is reached. One of the vehicles, usually one near the head of the train, decides to overturn, or at least to fall off the rails on the inner side of the curve. The reason for this may be a stiff coupling that is not pivoting sideways as it should do when on a curve. It is wise therefore to make sure that all couplings (especially on bogie stock) are free, and that they have not become bent up or down but lie fair to one another and so engage correctly. On the other hand we may have a light vehicle fitted with tinplate wheels running between heavier ones that may have die-cast wheels, and it is the lighter one that tends to come to grief. The remedy here is to make a practice of assembling the die-cast-wheeled vehicles at the head of the train, and letting the tinplate-wheeled ones follow. If this is unsatisfactory from the traffic point of view, in that unsuitable types are run together, the wheels can be exchanged between individual vehicles until the desired result is obtained.



An L.M.S. stopping train on a Hornby layout, headed by a No. 2 Special "Standard Compound."

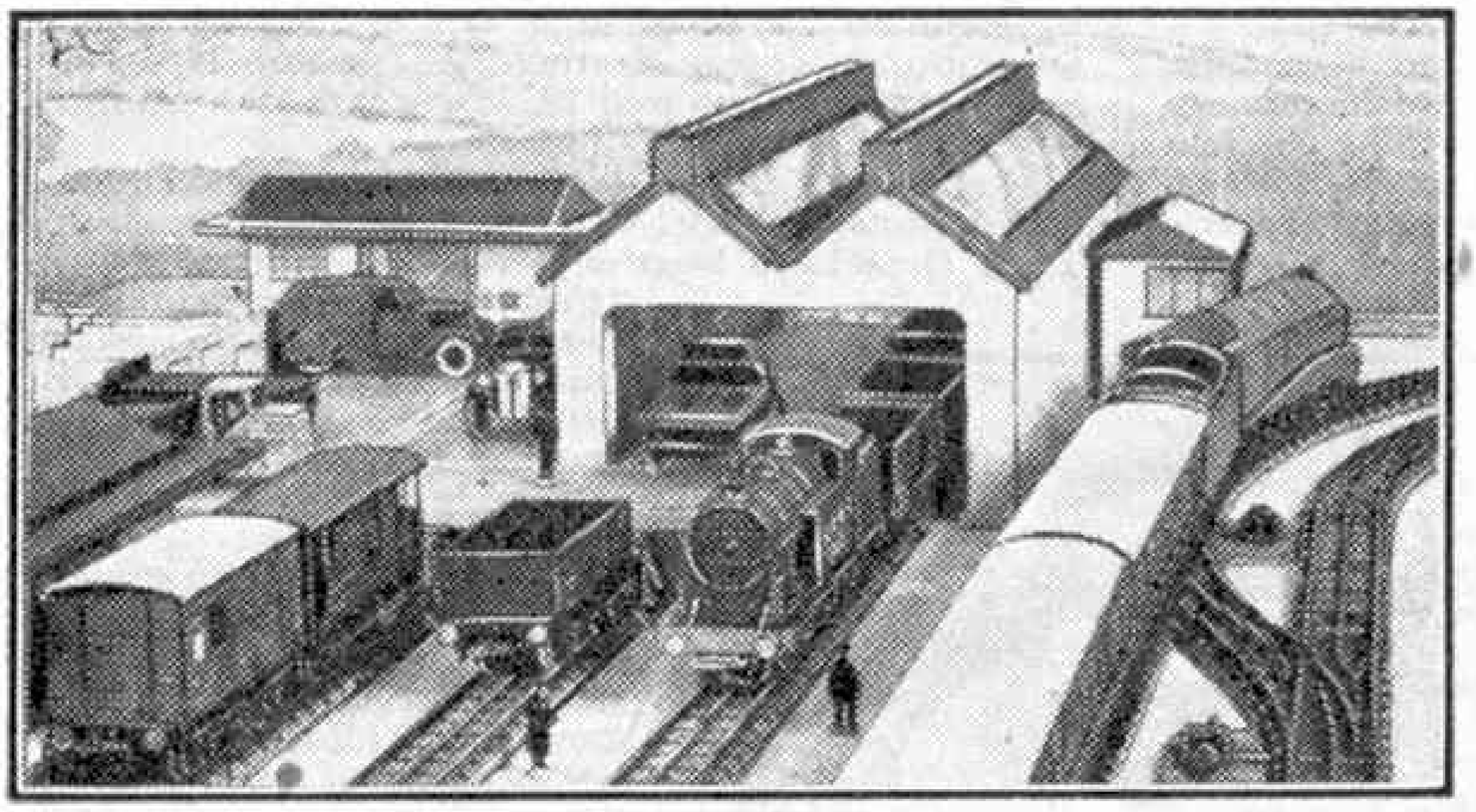
In general, covered vans should be fitted with die-cast wheels for running in fast trains, either goods or passenger, and they will then correspond with the "fitted" vehicles of real practice, which have automatic brakes for the same purpose. A fast freighter either real or model may be composed exclusively of such vehicles. On a mixed train, just as the real "vacuums"—as fitted vehicles are often called—hold pride of place behind the engine to assist in controlling the train, so our die-cast-wheeled vans will be together at the head of the train and for traffic purposes be considered as "fitted" stock.

Another point, though this applies particularly on clockwork railways, concerns "double-heading" or the use of two engines together on a train. This is quite an exciting business and heavy loads can be taken over fair distances. It is necessary, however, to exercise care in the types of engine that are used together in this way. The ideal combination, where we can manage it, is to have two engines of the same type or at least having the same type of mechanism. Where this is not possible, engines should be chosen that have nearly the same length of run, and as a rule it is wise to have the larger and more powerful of the two as the leading engine. This corresponds to normal L.N.E.R. practice in regard to double-headed trains, the assistant engine being coupled behind the actual train engine, which ensures that control of the brakes remains in the hands of the engineman booked to work the train. In miniature it ensures that the less powerful engine is not overrun by the larger one, as might occur in certain conditions.

When starting a double-headed train it is best to release the brakes of the leading engine first.

Dublo Buildings and their Uses

THE various buildings of the Hornby-Dublo range are well known to most of our readers and most Dublo layouts can boast perhaps a Station, an Island Platform, or possibly an Engine Shed among what we may call their lineside equipment. A good point about the Dublo buildings generally is their similarity in character, so that when used together they give a consistent appearance to the layout as a whole. This is of advantage in other ways too and makes it possible for us to use certain of the items not only in various ways, but also for purposes other than that for which they were originally designed.



A novel use for the Dublo Engine Shed. A goods station made up of platform section, the Engine Shed and the standard Goods Depot, as suggested in this article.

The adaptability of the City Station Outfit enables us to fit up a station either of the through or terminal kind according to the disposition of the various components; and apart from the standard schemes which we have often illustrated in these pages, little variations are possible according to the ideas of individual owners. The completed station can be arranged as a combined terminal and through station, and access to one or other of the side platforms for road vehicles can be gained by removing the detachable pan is. This latter feature is often useful for dealing with parcels and similar miscellaneous traffic such as is often handled at a station of this kind.

Another scheme that is quite effective, but requires more track than the standard "three-road" City Station layout, is to omit the centre island platform. The two side platforms are made to deal with all the traffic and are served by "slow" or "relief" lines, while two "fast" tracks pass through the centre of the station, the relief lines being "looped" off them by means of points in the orthodox manner often described in these pages.

Similarity in general design and finish makes the use together of the Main Line Station and the Island Platform quite realistic, and variations in the scheme are possible according to the particular station layout that is required. In its simplest form the combination of one of each of these accessories results in a three-road station. Two roads can be for main line traffic; the third, on the outer side of the "island," being reserved for the accommodation of a branch line train, the complete station forming an attractive country junction. Again we can have a four-platform or four track arrangement, two roads being for fast traffic and the other two for secondary traffic. The fast or main lines can be in the centre, or together at one side of the station.

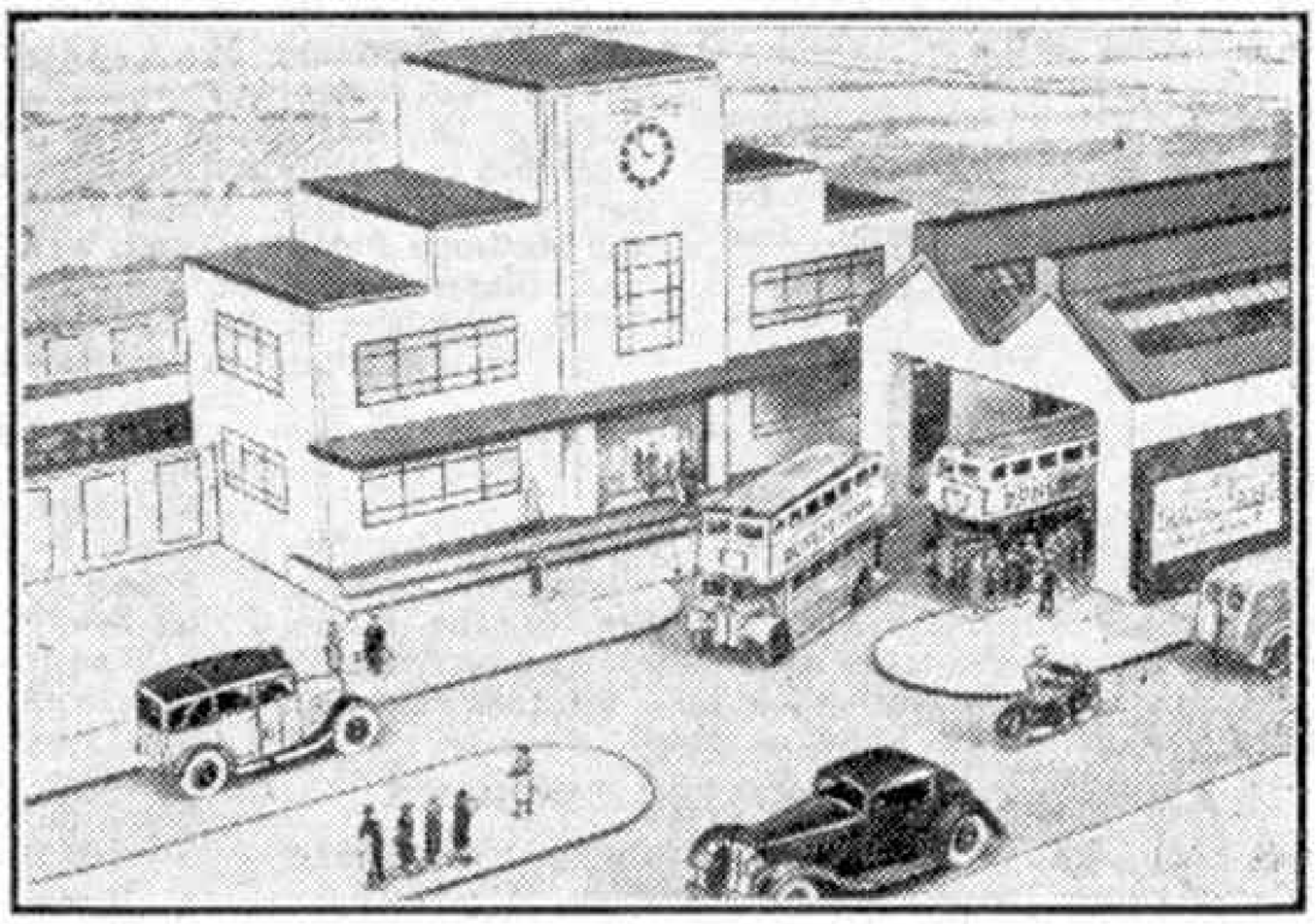
The Dublo Goods Depot is of the type which has its shed and office mounted on the platform or loading bank. A single line of rails can be brought alongside the platform, leaving the other side for the accommodation of road motor vehicles; or alternatively rails can serve both sides and road motors can be dealt with at one end.

At times we feel the need for a building more in the nature of a warehouse, or at least a covered depot, and here we find another use for that most versatile of Dublo buildings, the Engine Shed. Its employment for the housing of locomotives is of course obvious and we have from time to time dealt with engine yard layouts and Engine Shed arrangements. It has other possible uses besides, and can be adapted quite well to "Goods Department" requirements. It is excellent to represent a warehouse served by two tracks.

Another scheme is to use it as a goods shed as shown in one of the illustrations on this page. Here it accommodates a single line of rails and a platform section belonging to the City Station Outfit, which just fits in the available width nicely. Other sections are used to maintain the level of the loading bank thus formed and the standard Goods Depot is also linked up with the Shed building.

The Engine Shed can also be made use of as a carriage depot. Two such buildings can be used side by side if necessary, or they can be placed end-on.

Many Dublo railways maintain their own "Road Motor Department," and the Engine Shed can be pressed into use as a garage or maintenance depot. Another scheme is to use it as a covered bus terminus. One of our illustrations shows this scheme in use.



The Engine Shed makes a good bus depot outside the City terminus. Note the queue of miniature figures for the second bus.

Club and Branch News

WITH THE SECRETARY

CHRISTMAS THOUGHTS

Heartiest Christmas wishes to all my readers. I send out these greetings in brighter times than we have seen for more than four years and at a time too when Club and Branch activities are increasing. The season is a good one for doing everything possible to speed up progress and for this there is nothing like a good exhibition, which should inspire members, attract recruits and impress grown up people whose support will be helpful. So in every Club and Branch the possibility of arranging an exhibition either for Christmas or for the New Year should be looked into and the necessary planning started now, if it has not already been done.

There is no difficulty in arranging a good display and an enjoyable time for all. Model-building and a Hornby or Hornby-Dublo train layout will provide the central features; in some instances a film can be shown or a short lantern lecture given; in others there is a Club orchestra, or at any rate a pianist who can produce suitable music for the entertainment of visitors when required; and there are many forms of side show, guessing contests and so on that can easily be used as extra attractions. Add an Information Bureau, at which leaflets about the Guild and the Club movement are available for all who are interested, and where photographs or other exhibits connected with the story of the Club can be shown, and there is material for a fine evening's pleasure that should prove profitable.

Food rationing is still in force, but with a little persuasion in various quarters light refreshments can easily be arranged, and the time and effort spent on this is always well worth while. The great thing is to make an early start with preparations, so that there will be no hitch of any kind when the great day comes.

* * * *

I have been asked to find a Hornby or Hornby-Dublo enthusiast in the Finchley district of London who would supervise the activities of the model railway section of a large boys' club. Any reader with experience who is willing to take up this excellent work should let me know at once.

RECENTLY INCORPORATED BRANCHES

465. Brookmans Park—Mr. G. K. Evans, "Westfield," Mymms Drive, Brookmans Park, Nr. Hatfield.
466. Waverley—Mr. P. Barlow, Waverley Hotel, Eccles New Road, Salford 5.
467. Wood Green—Mr. M. J. Gilbert, 439, Lordship Lane, Wood Green, London N.22.

Mr. F. G. Appleton, seen in our illustration, is Chairman of the Wood Green Branch No. 467, Secretary M. J. Gilbert. This Branch was recently incorporated with the H.R.C., in August of this year. Mr. Appleton is a keen and experienced model railway enthusiast, whose own layout, the Methuen Park Railroad, was described and illustrated in the "M.M." for June 1943. Members of the Branch take part in operations on this layout.

CLUB NOTES

Navenby M.C.—Rev. K. T. Street has kindly accepted Leadership, and has provided a permanent Club room. This has been furnished and decorated by members. A programme was decided by vote at the Annual General Meeting. A Treasure Hunt also has been held. Club roll: 12. *Secretary:* P. I. Addison, High Street, Navenby, Lincoln.

Stapleford M.C.—Good progress is being made. In addition to model-building a Spelling Bee and a Train Quiz have been enjoyed, and a discussion on "*Hobbies*" has been held. New members are being enrolled. Club roll: 11. *Secretary:* P. R. Dennis, 36, Hickings Lane, Stapleford, Nottingham.

Hornsea M.C.—During the Summer Sessions French Cricket and Bowls were successful, and a football league has been organised for the Winter months. Films have been shown at ordinary meetings. Members have taken part in electrical constructions, book ends have been made in the woodwork section, and all have constructed excellent Meccano models. Mr. R. W. Shooter, Leader, has given a Lecture on "*Polar Exploration*," and indoor games have been played. Club roll: 46. *Secretary:* C. Kemp, 5, Carlton Terrace, Hornsea.

AUSTRALIA

Maylands M.C.—A welcome event has been a visit from Mr. V. Malmgreen, founder and former Leader, home on leave. Models have been constructed on a large scale for the Club's Exhibition, the centre of which will be a representation of a "Lancaster" factory. Film Shows have been given. Competitions are being organised. Club roll: 31. *Leader:* Mr. W. Petersen, 1, Warne Street, Maylands, Perth, Western Australia.

BRANCH NEWS

Stockton Technical School—All members took part in a harvest camp during August. When meetings were resumed the rolling stock was overhauled and signalling practised. A Flying Model Aeroplane Contest has been commenced. *Secretary:* R. N. Fraser, 11, Hereford Terrace, Cowpen Est., Billingham-on-Tees, Co. Durham.

Woodlands—The layout is continually being improved, the latest additions being coloured lights and other signalling devices. Discussions are taking place on railway topics. Dinky Toy bus services have been introduced. *Secretary:* D. Kennington, 58, Scalby Grove, Derringham Bank, Hull.

Dukinfield—Well-varied track operations and General Knowledge Tests have been enjoyed. Scale drawings of L.N.E.R. locomotives have been shown. *Secretary:* L. D. Broadbent, 395, Cheetham Hill Road, Dukinfield.

Competitions! Open To All Readers

What Names are Hidden Here?

Advertisements in this December issue of the "*M.M.*," heralding the Christmas season, are not as many in number as they were in pre-war days, nor are there so many good things described and illustrated in them. Yet readers will turn eagerly to see what they contain, and we are therefore basing our competition this month on them.

In the panel on this page there is a square comprising 81 letters. These have been so arranged that the names of products advertised in this issue of the "*M.M.*," or of the firms advertising them, can be read. The names are traced by starting anywhere and passing at each move to the letter to the left or right, or to that above or below. No diagonal moves must be made, and every letter of the square must be used at least once. There is no restriction on the number of times that a letter can be included in a name, and indeed many letters appear in more than one name, giving an interlocking effect.

K	C	E	B	A	Z	O	L	I
T	M	R	E	C	E	M	S	W
T	I	L	L	C	D	B	O	E
U	L	F	D	A	U	D	N	B
B	H	O	R	N	B	Y	E	L
R	A	G	F	O	L	T	S	A
L	M	N	O	E	A	R	L	N
E	I	A	Y	L	I	P	O	U
Y	R	T	T	O	C	S	W	D

In their solutions competitors must give the names of the product or advertisers concerned, and the numbers of the pages on which the advertisements appear. Their entries should be addressed "*Advertisement Letter Square, Meccano Magazine, Binns Road, Liverpool 13.*" There will be two sections in the contest, for Home and Overseas readers respectively, and in each prizes of 21/–, 10/6 and 5/– will be awarded, with consolation prizes for other good efforts. The judges will take neatness and novelty into account in making their final decision if there is a tie for any prize.

The closing date in the Home Section is 31st January, 1945, and that in the Overseas Section, 31st July, 1945. Competitors must not omit their names and addresses on their entries.

Can You Draw a Train or a Tram?

This month we are giving the many artists among our readers a chance to express themselves. Contrary to the usual "Go as you please" competitions of this type, we are restricting the entrants in this drawing contest to certain kinds of transport, but this will not be a handicap, for every reader of the "*M.M.*" has at times set out to draw trains, buses, and tramcars, and there are plenty of these about for them to examine to make sure of getting details right if they decide to draw some existing model.

The entries must be drawings of one of the following:

1. A Passenger Train.
2. A Trolley Bus.
3. A Motor Bus.
4. A Tramcar.

The drawing submitted can either be based on present day designs or can be of a futuristic nature; we leave the choice to the competitor. Colour can be used if desired, but it is not essential, as the judges will base their decisions on actual drawing skill, taking novelty and accuracy into account if necessary.

The competition will be divided into two sections, for Home and Overseas readers respectively, and in each of these prizes of 21/–, 10/6 and 5/– will be awarded for the best entries. A number of consolation prizes also will be awarded for other entries that deserve recognition. Entries should be addressed "*December Transport Drawing Contest, Meccano Magazine, Binns Road, Liverpool 13,*" and posted to reach here not later than 31st January, 1945 if they are in the Home Section, and 31st July 1945 if they are in the Overseas Section.

Competitors are particularly asked to make sure that their name, full postal address, and age are clearly written on the back of their entries, as we are still receiving a number of entries each month which do not comply with these rules and which in consequence have to be disqualified.

December Photographic Contest

This month's photographic contest is the 12th of our 1944 series, and in it, as usual prizes are offered for the best photographs of any kind submitted. There are two conditions—1, that the photograph must have been taken by the competitor, and 2, that on the back of each print must be stated exactly what the photograph represents. A fancy title may be added if the entrant desires.

Entries will be divided into two sections, A for readers aged 16 and over, and B for those under 16. They should be addressed "*December Photo Contest, Meccano Magazine, Binns Road, Liverpool 13.*" There will be separate sections for Overseas readers.

In each section prizes of 15/– and 7/6 will be awarded, together with consolation prizes for good efforts. Closing dates: Home Section, 31st December; Overseas Section, 30th June, 1945.

* * * *

A Correction. The total in the 5th column of the November Locomotive Figureword Contest should be 69, not 61 as shown.

FOR SERIOUS COLLECTORS

Our Bargain "Discount" Approvals contain a fine range of picked Modern and New Issues, Pictorials, Commems., etc., from 1d.—6d. each, less a generous discount (**GENERAL SELECTIONS ONLY. NO SINGLE COUNTRIES OR G.B.**). Approvals or details are post free, and we do NOT send again unless requested. Br. Colonial or Mixed selections available, but no All-Foreign.

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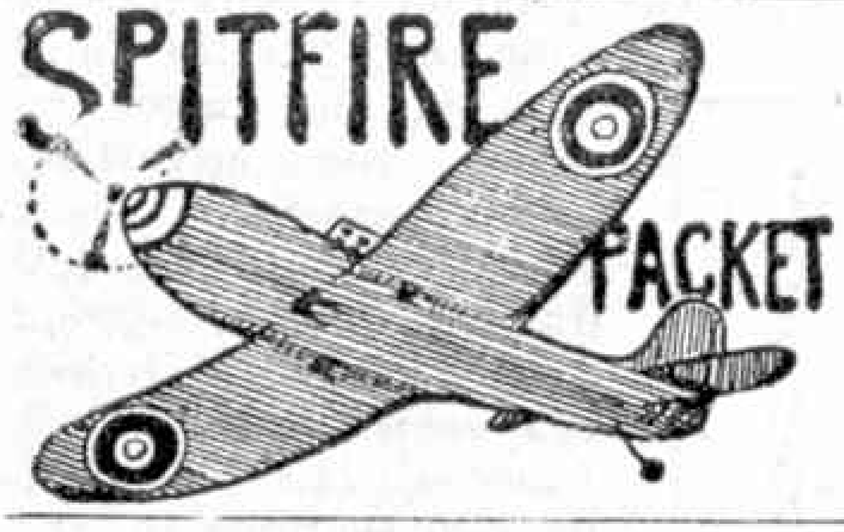

PACKET contains 30 air, triangular, and stamps with aeroplanes, etc.—2 LIBERIA triangular (with aeroplane); NIGERIA; F. OCEANIA; MOZAMBIQUE (Elephants); INDIA; 2 Canada; S. AFRICA (Pictorial; 2 TANGANYIKA; PALESTINE; BRAZIL (aeroplane design, etc.); 5 U.S.A.; ICELAND (Fish); Australia; CAYMAN IS. (Pictorial); NEW CALEDONIA; CAMEROONS; ST. PIERRE; MOZAMBIQUE (Pictorial); MADAGASCAR; PHILIPPINE IS.; CEYLON (Pictorial); EGYPT; JAPAN (Emperor). Price 5½d., post 2½d. extra. Applicants for approvals receive 6 Pictorial S. Africa and in addition, those sending addresses of stamp collecting friends get set of 4 JAMAICA. **BARGAINS**—100 B. Cols. 2/6; 12 Free French (Cols.) 9d.; 20 Rhodesia 1/6. ASK for LISTS 1d. **H. C. WATKINS (MM), Granville Road, BARNET**

FREE TO ALL

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As a special Christmas attraction we offer old and new customers quite free a packet of about 250 **pre-war quality** stamp hinges — practically impossible to buy to-day. Just send 2½d. for postage, and ask to see one of our fine selections of modern stamps, ½d. upwards, on approval (that is if you are not already receiving such selections regularly from us). Write to-day to:
CAPT. M. CAMPBELL & CO. (Dept. MM)
15, North West House, West St., Brighton

THE BOMBER AND SUBMARINE PACKET FREE!

One of the most interesting pictorial stamps ever issued is included in this wonderful packet of good stamps. It depicts a Wellington bomber attacking a German submarine in the Atlantic. Other stamps include Australia (late issue), Eire, obsolete foreign, portrait King Victor Emmanuel, large Belgian Railway issue, Czecho-Slovakia, old French Republic, U.S.A., and finally a pair of unused issues overprinted with new value, and to the first 500 applicants, a beautiful large unused French "De Gaulle" issue. The whole collection absolutely free to all collectors sending 3d. for postage and requesting approvals.

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C. A. RUSH, 38, Queen's Avenue, Whetstone, London N.20

MALTA G.C.

An unused set in the new colours, ONLY JUST ISSUED, from the George Cross Island, showing H.M.S. St. Angelo, Verdala Palace, and a pre-historic Underground Vault sent free to all applicants for approvals enclosing 2½d. postage.

R. D. HARRISON, ROYDON, WARE

The "CAPTAIN COOK" Packet

FREE! Grand stamps commemorating that **"Hero of the South Seas," Capt. Cook** (1728-79), incl. fine **Cook Is.** (as reduced illus.), his **Sailing Ship** *Endeavour*, with **Chart**, also **'Landing of Capt. Cook,'** etc. Just send 3d. postage for this grand romantic packet, and ask to see special "Mercury" Approvals.

Philip J. Dyke (P.T.S.), 35, Buckleigh Ave., London S.W.20

FINE FREE GIFT PACKET including set of mint Transjordan, and mint Cayman Isles Pictorial, to all requesting our bargain discount approvals of PICTORIALS, COMMEMORATIVES and TRIANGULARS.

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AUSTRALIA 1934 1/6 AIR MAIL used	...	6d.
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For other Stamp Advertisements see also pages 428 and viii.

Stamp Collecting

Christmas Seals and Sidelines in Stamps

By F. Riley, B.Sc.

THIS is the Christmas season, a festival that we celebrate to the best of our ability in spite of wartime difficulties. For stamp collectors an interesting association with the season comes through Christmas seals. We have none of these in Great Britain, but in such countries as Canada, South Africa, Denmark, Norway, Bolivia and the United States they have been issued for years and have provided handsome sums for charity. Although they are sold over the counter in Post Offices, they are not stamps, that is they are of no use for franking purposes, and usually they are placed on the backs of the envelopes.

As our three illustrations of Christmas seals suggest, these are very attractive in appearance and well worth the attention of collectors on the lookout for an interesting sideline. They are extensively collected in the countries in which they are issued, and it is not difficult to find them in Great Britain. They cost little or nothing. A scout around among your friends may easily bring some of them to light, and there is always a possibility that a stamp dealer may have a few, which no doubt he would be willing to part with to any of his customers who are interested.

Christmas seals vary considerably in design. Some of them indeed are rather ambitious, like the one at the head of this column, which shows a symbolic cot and is in colour. In fact seals are usually in striking colour, with Christmas greetings in some form, such as the "*God Jul*," which simply means "*A Good Yuletide*," of the Norwegian example shown here. It is interesting to know that South African seals are issued in bilingual pairs, just as the stamps of that country are. Another peculiarity of the S.A. seals is that they are very often placed alongside the postage stamps used and thus receive a cancellation. But that doesn't make them stamps!

Sidelines to stamp collecting are many and varied, and this is a good opportunity to make a few suggestions that should interest readers of the Magazine. Nothing of course can replace systematic stamp collecting itself, but this may not appeal to all readers, and others may lack the time to make and display a good general collection, or a specialist collection of one or more countries. One very interesting sideline collection could be made of stamps reproducing masterpieces of engineering, and could well be started with a stamp of the design of the Australian issue of 1932, which shows Sydney Harbour Bridge. The actual stamp reproduced at the head of this column is the 5/- value, which has increased very largely in price, but there were two lower values that should be quite easily obtainable. Equally good results can be achieved by those interested in ships, with examples ranging from dhows and Viking long ships to modern liners, while railways and road transport also provide a wealth of material. In this connection we cannot overlook the aeroplane, which is becoming increasingly popular as a subject for stamp design and certainly will appeal to many "*M.M.*" readers.

Other suggestions that might be offered to stamp collectors on the lookout for sidelines of interest include animal and plant life, the cities of the world, famous buildings and even maps on stamps. Portrait stamps also would make an excellent sideline effort, especially if the collector took the trouble to write up the collection well. Whatever he does, the great thing for the collector to remember in setting out on some stamp sideline is to make sure that it is one in which he is deeply interested. It is a hobby, and therefore must be something that he likes, and there is real value as well as pleasure in it, even if the basis of it is merely shape or colour. Thus a collection of triangular stamps can be made very attractive.

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For other Stamp Advertisements see also pages 426 and viii.

Stamp Gossip
and Notes on New Issues

By F. E. Metcalfe

IT has been mentioned previously that Zanzibar was issuing a commemorative set in honour of the bicentenary of the Al Bu Said dynasty, which has ruled over that country for 200 years. There is news now that these stamps were issued 20th November, which is the actual date of the anniversary. Unfortunately the "*M.M.*" goes to press too early to allow our illustrating a copy of the stamps this month, but we should be able to do so in the January issue.

It is said that there will only be one printing, so readers will be well advised to buy their sets as soon as possible, and as these should not cost more than half a crown each to begin with they will be within the reach of most.

In connection with the same celebration India has announced that all stamps to 2 r. as well as 10 service stamps to 1 r. will be overprinted "*Al Bu Said 1363*" in Arabic. These were placed on sale 20th November and will be withdrawn 31st December. Again speed in purchasing is indicated, for these stamps, once they are obsolete, will go to a much higher price than their face value.

It is quite possible that some of the Indian States also may issue special stamps, but nothing is known about these at the moment. Aden, Aden States and British Somaliland are also countries to watch, for this celebration of the "Al Bu Said" bicentenary is an important one in the Arab world.

Last month readers were told that there was no need to worry yet about the forthcoming Jamaica commemorative set, as not only would there be plenty to go round when they did appear, but this would not be for some time. This word of advice was prompted by offers in the philatelic papers for collectors to send along their cash to book a set, else—etc., etc. Well, official advice is now available that the set in question will probably not appear for another 10 months or so.

Dealers who have been rushing things will now have to go to the trouble of returning cash, which is what happened, to give one notable instance, when the Canadian Government sent supplies of their war issue to London and the British Treasury refused permission for the stamps to be marketed in Great Britain.

The U.S.A. has been at it again. This, the only country—vide the American newspaper—which alone never emits special stamps, has just issued the 13th stamp in honour of an oppressed nation, and the 14th will probably be out by the time these words appear. The 13th stamp is illustrated here. It is a rather handsome affair, in spite of the fact that at first glance one might take the centre of the design for a Jew's harp. The country honoured is the Philippines, and owing to its different political status, the usual "Flag" design was not considered appropriate; hence the change. The stamp does credit to its designer, as well as the U.S. Post Office, which once more will gain a very nice sum. Our Post Office apparently is so rich that it does not need such fillips to its revenue!

We have already illustrated the kind of ordinary stamps, apart from special issues, which are in use in Germany. Now one from Belgium is shown. This country has continued to turn out commemorative stamps, almost *ad lib*, but for everyday use they have apparently gone on using stamps similar in design to those current—when they were over-run, with altered values to meet changed circumstances.

Another stamp from a neighbouring country is an attractive one from Holland. It forms part of a delightful set of seven values; there appears to be no special significance about its issuance; what a contrast to our own stamps. All the warnings in the world against buying this kind of stamps may be uttered, but if the price is low—and the face value of this Dutch set is only about sixpence—collectors will simply not be able to resist them, and to be quite candid the writer of this will probably tuck away a few.

Vatican stamps have always had a special appeal to many collectors for rather obvious reasons, and the one we are showing from a recently issued set of three, with its striking design, will certainly interest a number of collectors. At the moment it is not possible to import stamps from Vatican City, but a number of used copies trickle through all the time, and should not be very hard to come by.

There is now a good deal of talk in philatelic circles regarding the issue of a Victory set of stamps, once Germany has been defeated. One would hardly have thought, taking everything into consideration, including the political aspect, that anyone could be found to argue against the proposal, yet apparently there are odd people who do, but they can be safely ignored, as they represent nobody but a tiny minority. When the special stamps this country has issued already are considered, it must be admitted that it is taking a bit of a risk at the expense of our artistic reputation to suggest further efforts, particularly if present designs, which apparently satisfy the Post Office authorities, are any criterion of what we might get.

The 6d. and 1/– values of the present set of Turks and Caicos Islands are to be changed in colour. None of the two stamps to be changed will be sent here from the colony so they should prove very good property indeed. Any collector who can buy them for under 5/– a pair should not fail to do so.

The Air Forces of the United States—

(*Continued from page 402*)

"direction" of labour—men and women can come and go and work where they like or can get the best pay; and that the output of ordinary "consumers' goods" is still up to 80 per cent. of pre-war things such as clothes and toys and household stuff that we have not seen for three years. That may give you some notion of how far the States are from being full out or all in. They can spare all those young men to do work which our girls have been doing for years under compulsion.

No wonder people look upon the United States as the World Power of the future. What could those millions of people do if they were really stretched in self-defence? In this article I have only given a mere sketch of what might be written about the might of the United States in the air. But I still believe that the British Commonwealth of Nations can fully hold its own in the world.

This tiny island, which, with the Dominions, fought this war by itself for two years and more, can look after itself in peace. But I do admire and thank the United States for the splendid part they have played in the war while they have been in it.

On the Track of the "Irish Mail"—

(*Continued from page 405*)

ordinary and excursion trains in normal summers, now follow in quick succession, though with open country and hills between—Prestatyn, Rhyl, Colwyn Bay, Llandudno (reached by a busy 3 mile branch from Llandudno Junction), Penmaenmawr, and so on. As far as Llandudno Junction there are four tracks most of the way from Chester. Along the coast the two down lines and two up tracks are laid side by side, so exciting races take place sometimes, fast trains appearing to be running "neck and neck." Between Llandudno Junction and Bangor, beyond quaint old Conway with its bridges and castle, there are tunnels through rocky headlands, as well as a viaduct right over the shore.

In short, it is a most entertaining railway!

The Art of Shipbuilding—(*Continued from page 412*)

they have been made possible only by the extensive use of welding and pre-fabrication, by the most intensive planning, and by the absolute necessity for ships and more ships to meet the U-boat menace and carry the war cargoes of the Allies all over the world.

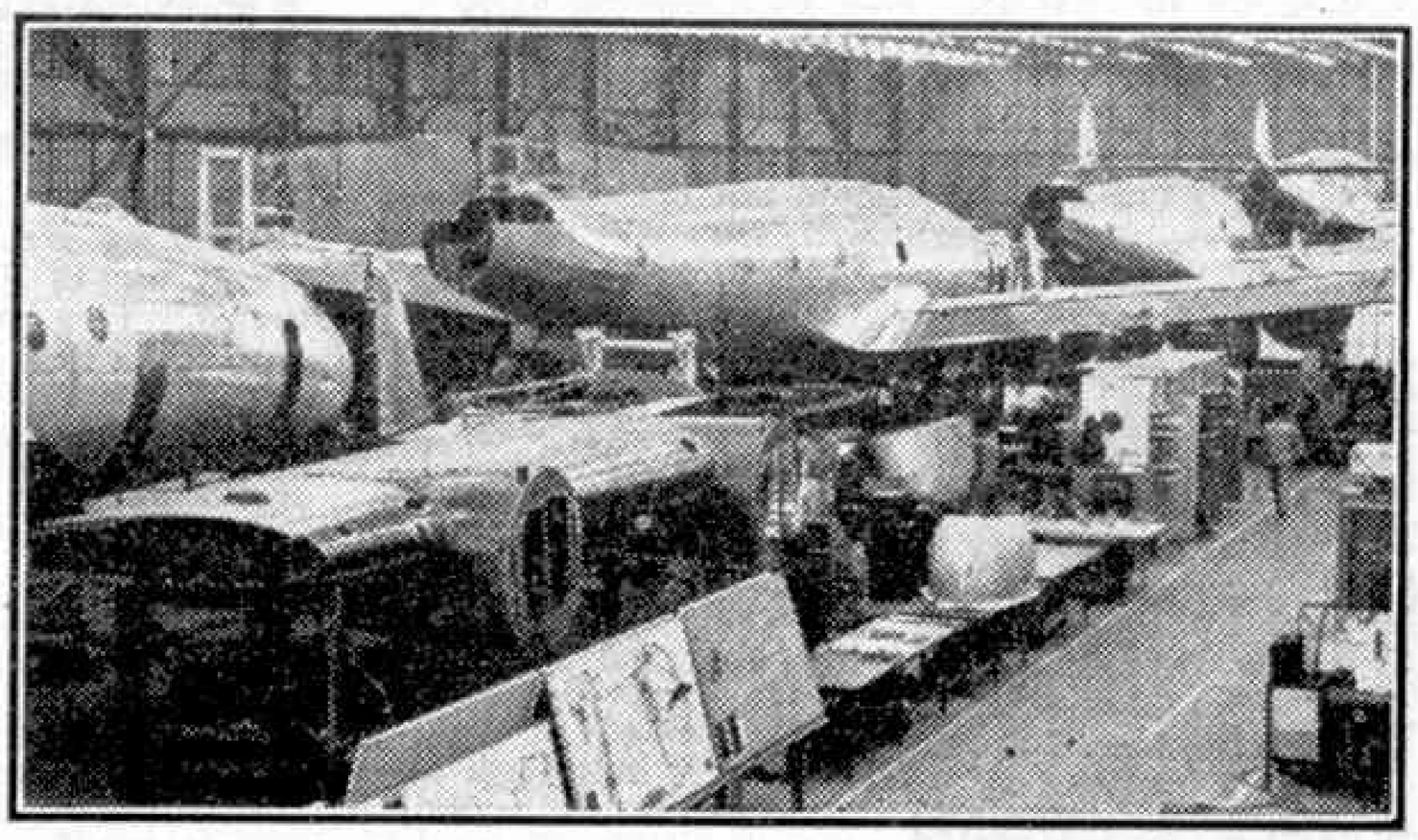
It may be mentioned in conclusion that welding, as used in shipbuilding, is not peculiar to the U.S.A., for long before the war some small vessels built on the Tyne and the Clyde were wholly welded. It is not likely, however, even after the war, that many all welded ships will be built in this country.

"THE BEDSTEAD EXPRESS"

By Peter Clowes

A novel and interesting 7¼ in. gauge railway is situated on an allotment in Stockport, Cheshire. Its owner, Mr. J. Houghton, is an aircraft engineer, and the locomotive "*Auderyldean*," named after his three daughters, Audrey, Beryl and Jean, has been built from odd pieces of metal from old motor cars and bedsteads. The plans were sketched on the back of a cigarette packet as long ago as 1935, and the locomotive made its first appearance on the rails of the Edgeley Park Miniature Railway just before the outbreak of war. Crowds of excited children have ridden behind it among the cabbages and peas. I have been at the controls ahead of a full load of them and found the engine easy to handle if driven carefully. Speeds of well above 20 m.p.h. are possible on a good stretch of track.

"*Auderyldean*" is an 0-4-2 locomotive designed on Continental lines with an eight-wheel bogie tender. Her scale is 1 in. to 1 ft. and the working pressure is 90 lb. per sq. in. The engine has two cylinders and Walschaerts valve motion is fitted. To save time and expense the wheels, of 5¼ in. diameter, are made of cast iron and the copper boiler is hand-flanged and riveted. A set of piston rings, a water gauge and a pressure gauge are the only commercial products on the locomotive.



On the assembly line. Lockheed C-69 "Constellation" transport aircraft under construction for the U.S. Army Air Forces. Photograph by courtesy of the Lockheed Aircraft Corporation, U.S.A.

The train fits in well with the surroundings as it races between high grass and towering bushes, smoke pouring from the high funnel and steam from the ingenious little safety valve. Mr. Houghton intends to enlarge the present station, with its two platforms, carriage sheds and solitary water tank, and to build a tunnel. The foundations of a girder bridge have already been laid.

COMPETITION RESULTS

HOME

July "Locomotive Parts" Contest.—1st Prize: G. Wilsher, London N.W.2; 2nd Prize: P. W. Miles, Enfield; 3rd Prize: G. Tiller, Southampton. Consolation Prizes: C. E. Wrayford, Bovey Tracey; D. Watson, Glasgow S.1; R. P. Rowe, Wigan; F. Linton, Mirfield.

July "Photographic" Contest.—1st Prizes, Section A: J. Murphy, Glasgow C4; Section B: R. J. Vickers, Norton-on-Tees. 2nd Prizes, Section A: J. H. Gittens, Weybridge; Section B: G. M. Worstenholme, Horsforth. Consolation Prizes: R. Hogg, London S.W.12; B. Chulindra, Cornwall; M. Wells, Aberdeen.

August "Thrills" Contest.—1st Prize: C. Carter, Shanklin; 2nd Prize: E. G. Smith, Chorlton-cum-Hardy; 3rd Prize: F. L. Lean, Saltash. Consolation Prizes: G. R. Esslemont, Newcastle 7; M. Phillips, Sutton Coldfield; D. Warner, Coundon; G. Cohen, Birmingham 12.

August "Locomotive Names" Contest.—1st Prize: L. S. Shackleford, London W.3; 2nd Prize: R. Y. Pomfret, Blackburn; 3rd Prize: G. D. Harden, London S.W.18. Consolation Prizes: S. Rae, Romford; P. F. Marshall, Eccleshall; K. Jones, Kenton; G. E. Skelland, Warrington; D. Stoddard, Longton; H. W. Hurst, Dewsbury.

Fireside Fun

"When my uncle died he left over 500 clocks."
"Is that so? His estate must have taken a long time to wind up."

* * * *

Mother: "As you are eight to-morrow I am getting you a nice cake. Would you like one with eight candles?"
Tommy: "No. I would like a candle with eight cakes."

"Will you give a push to the top of the hill? It's too much for one donkey."

* * * * *

"Is this bread really to-day's?"
"Of course it is. Isn't it always to-day's?"
"No, yesterday's wasn't."

* * * *

Teacher: "Now, "ous" at the end of a word means 'full of,' as in delirious, full of delirium. Now, John, give me another example."
John: "Pious means full of pie, miss."

* * * *

THIS MONTH'S HOWLER

A herbaceous border is a lodger who doesn't eat meat.

* * * *

BRAIN TEASERS

A MAGICAL CHANGE

In a magic square the figures in rows, columns and diagonals add up to the same total. The square given below is not a magic one, because the totals of the rows, columns and diagonals are not the same. Can you cut the diagram into four pieces that can be fitted together in a different way to give a magic square?

1	15	5	12
8	10	4	9
11	6	16	2
14	3	13	7

J.B.K.

WHAT DID HE WANT THEM FOR?

We don't know why Mr. Thoroughbred suddenly decided to spend some of his spare cash on horses, but he did and altogether he got rid of £1,050 in this way. Later he was told that horses had become cheaper and that he if had waited a little while he could have got another horse for his money. When he looked into it he found that he could then have bought each horse for £5 less. How many horses did he buy and what did he give for each?

HOW MUCH WOULD THE WORM LEAN?

On Smith's grandfather's bookshelves there was an old encyclopaedia in 26 volumes, printed on old-fashioned heavy paper so that each volume was 3 in. thick. How far would a bookworm crawl if it made its way from beginning to end of the mass of learning?

PROFITING BY HIS MISTAKES?

A shop assistant was told to mark the price of a certain article, but when he made out the ticket he changed the numbers of the pounds and shillings in error. There were no pence in the amount. When the mistake was discovered it was found that the error had doubled the price of the article. What should he have written on the price ticket?

SOLUTIONS TO LAST MONTH'S PUZZLES

The solutions to the keyword addition sum in our first Brain Teaser last month is:

2,7491
649
12,349

40,489

The keyword then is "*Scrambling.*" Other figure combinations may give a respectable sum from an arithmetical point of view, but do not produce a keyword.

* * * *

"My! These oatcakes are tough."
"Oatcakes! They're cork mats to put your plates on."

* * * *

How many were caught by our "General Ignorance" question? All five roads mentioned in it start from London. A1 ends at Edinburgh, A2 at Dover, A3 at Portsmouth, A4 at Bristol and A5 at Holyhead.

The American aeroplane or car names hidden in our last puzzle were: Black Widow; Studebaker; Plymouth; Avenger; Liberator; and Packard. How many readers detected the error in the fourth of these? This month there is a deliberate mistake in this column. What is it?

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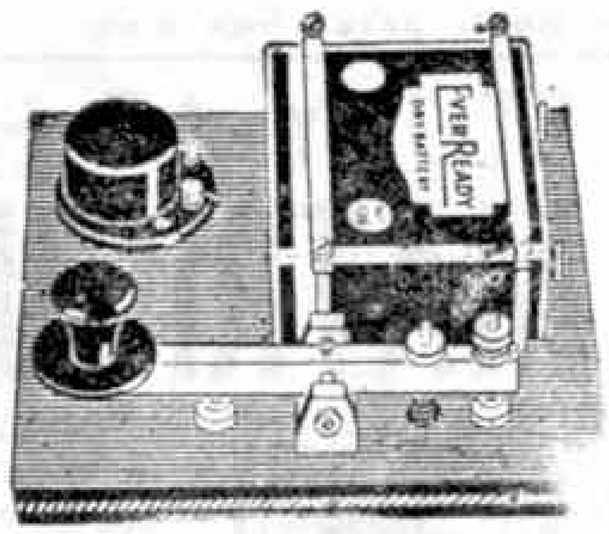

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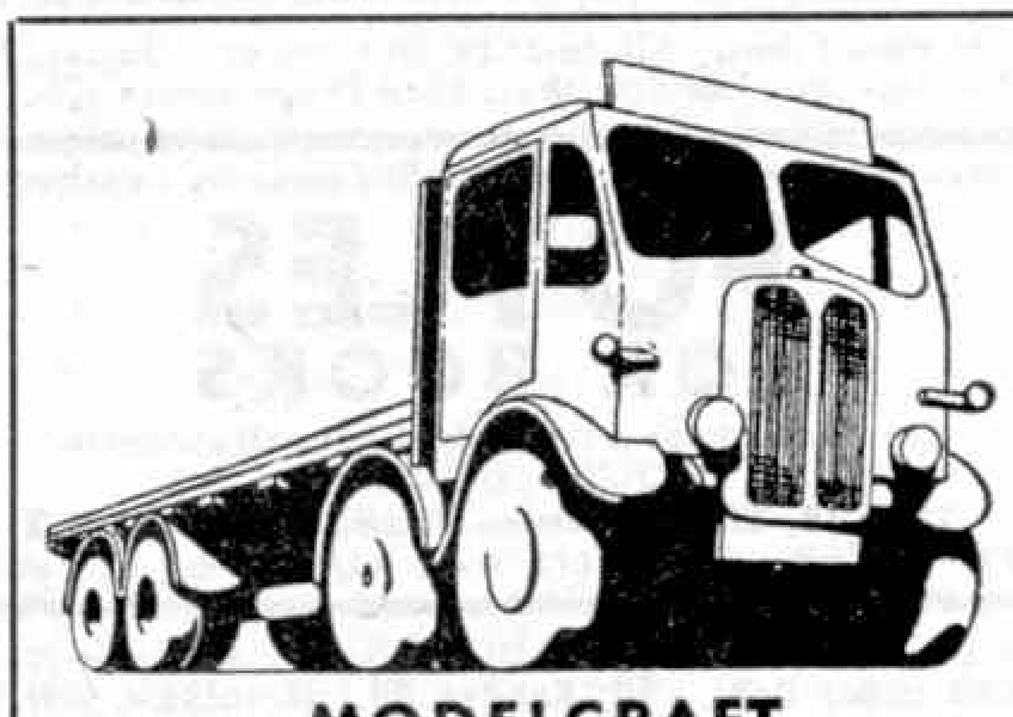

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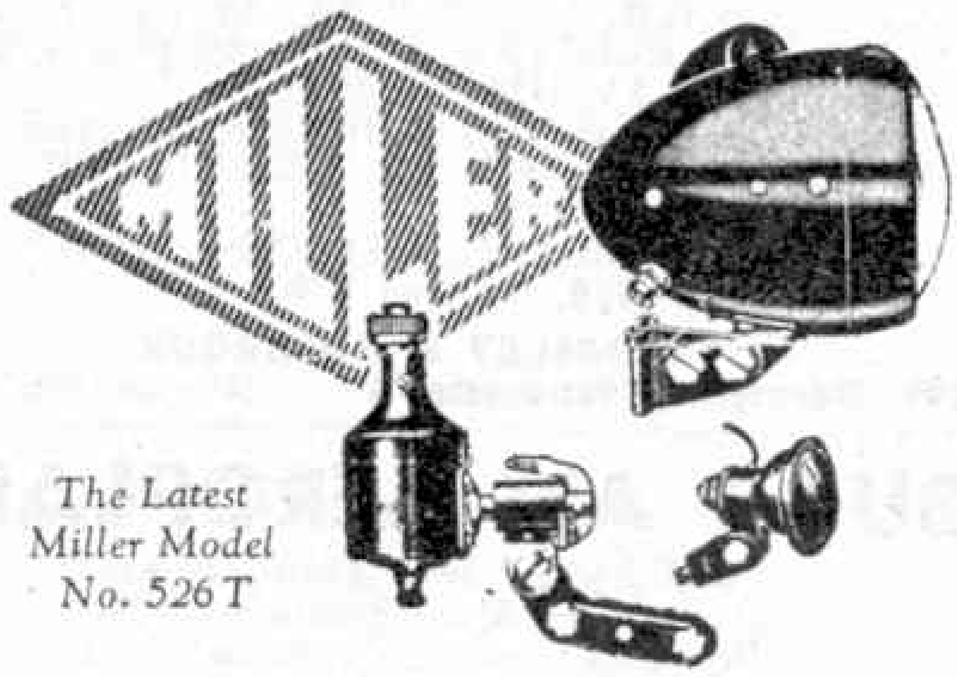

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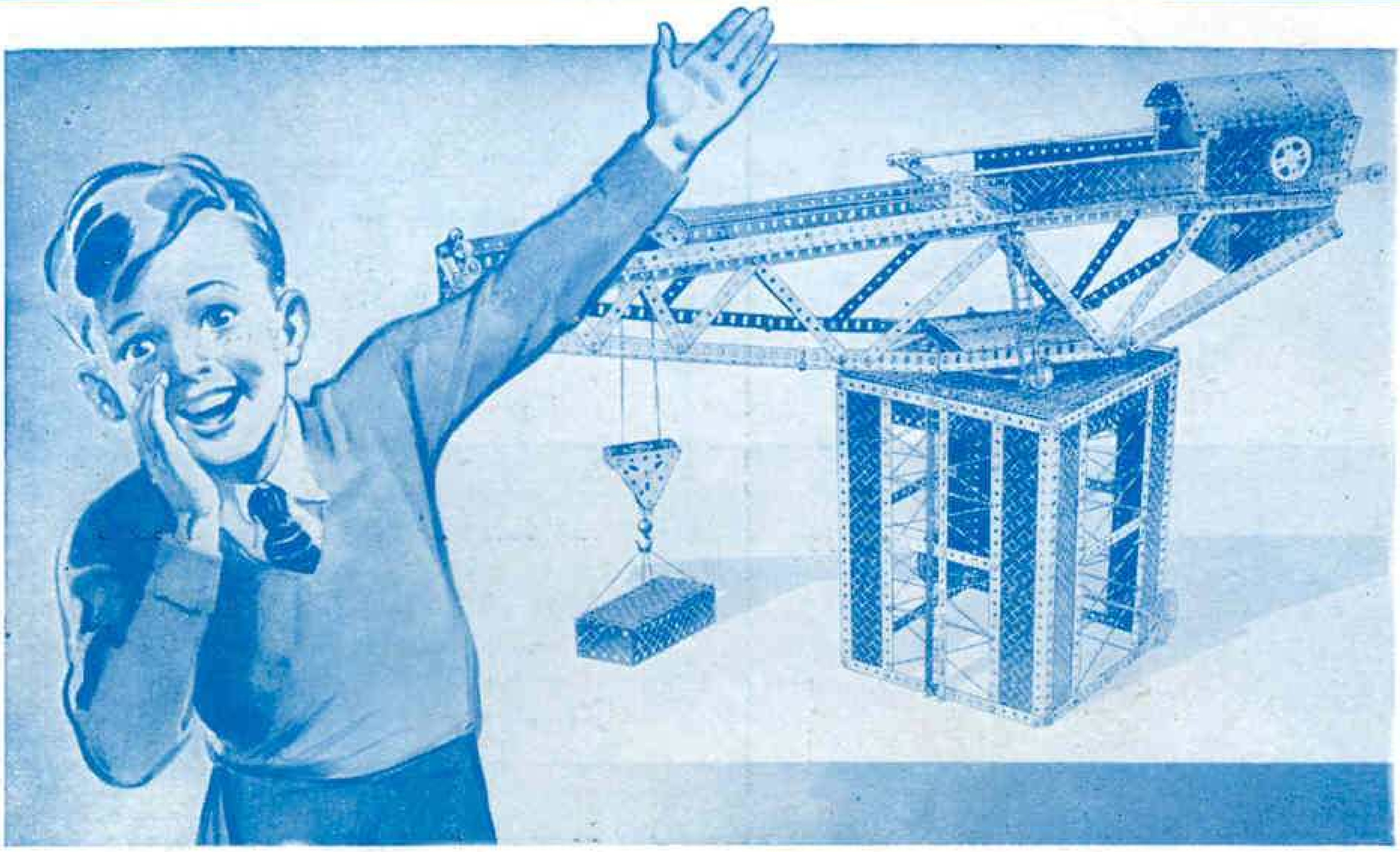

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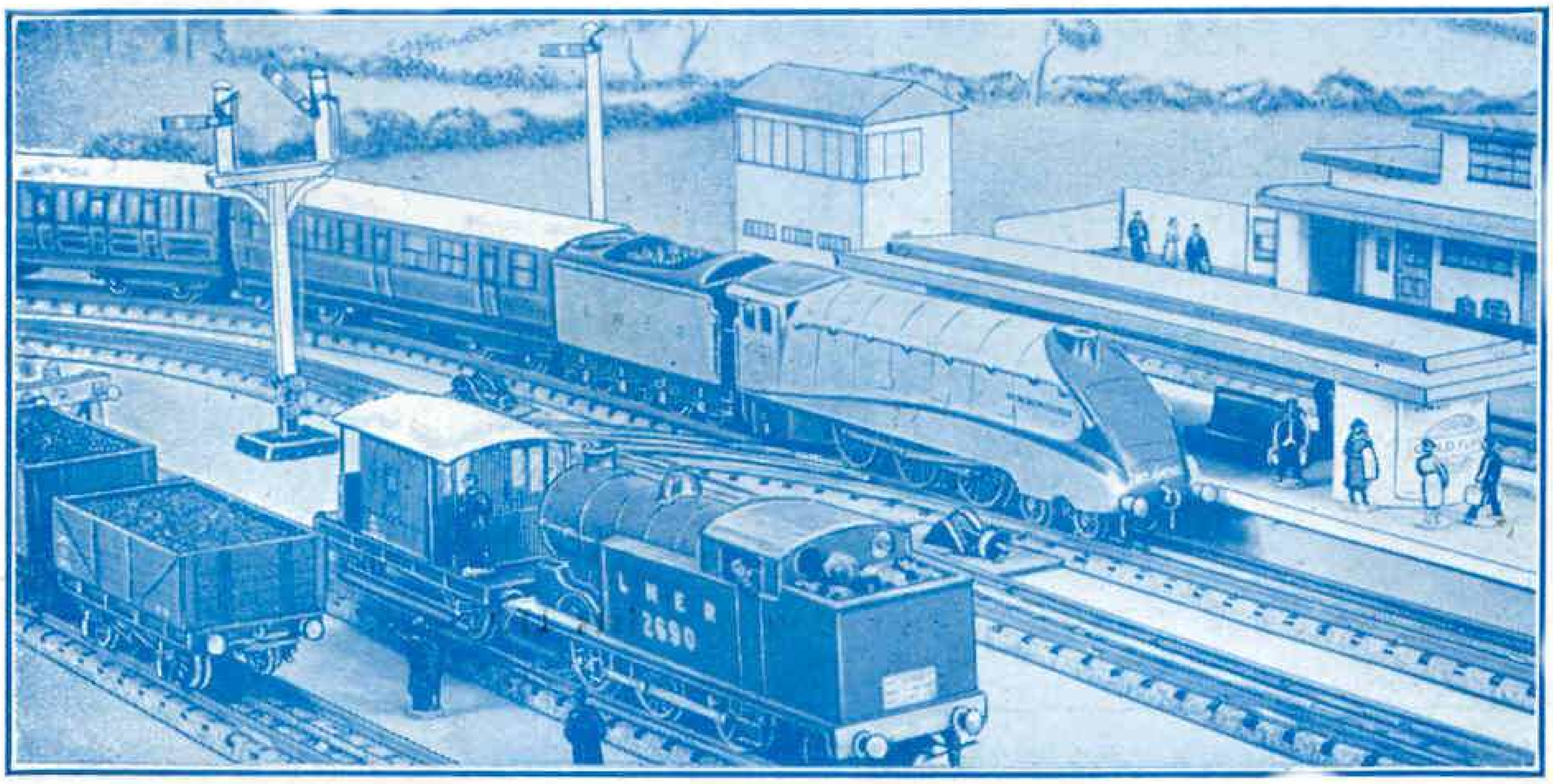

PUBLISHED BY MECCANO LTD., BINNS ROAD, LIVERPOOL 13, ENGLAND.
Printed by John Waddington Ltd., Leeds and London.